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SURVEYING AND MAPPING

Editor-in-Chief
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Volume XVI, No. 3
July–September 1956

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Surveying Texas mud flats. Shell Oil Company party uses tractor with platform built for level.

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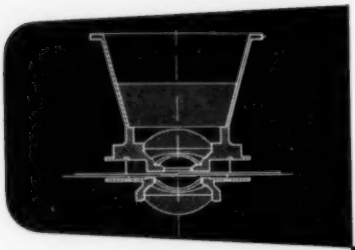

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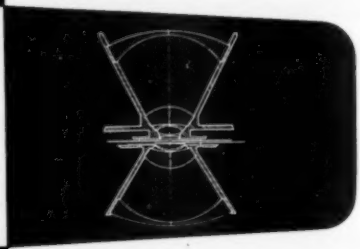

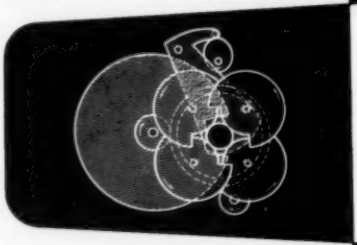

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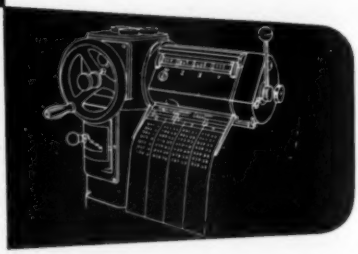

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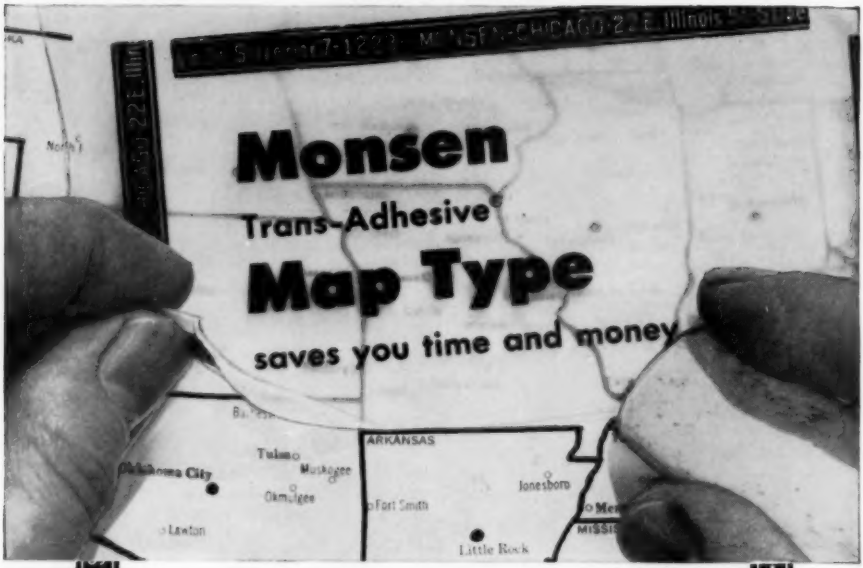

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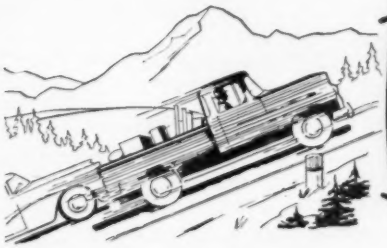

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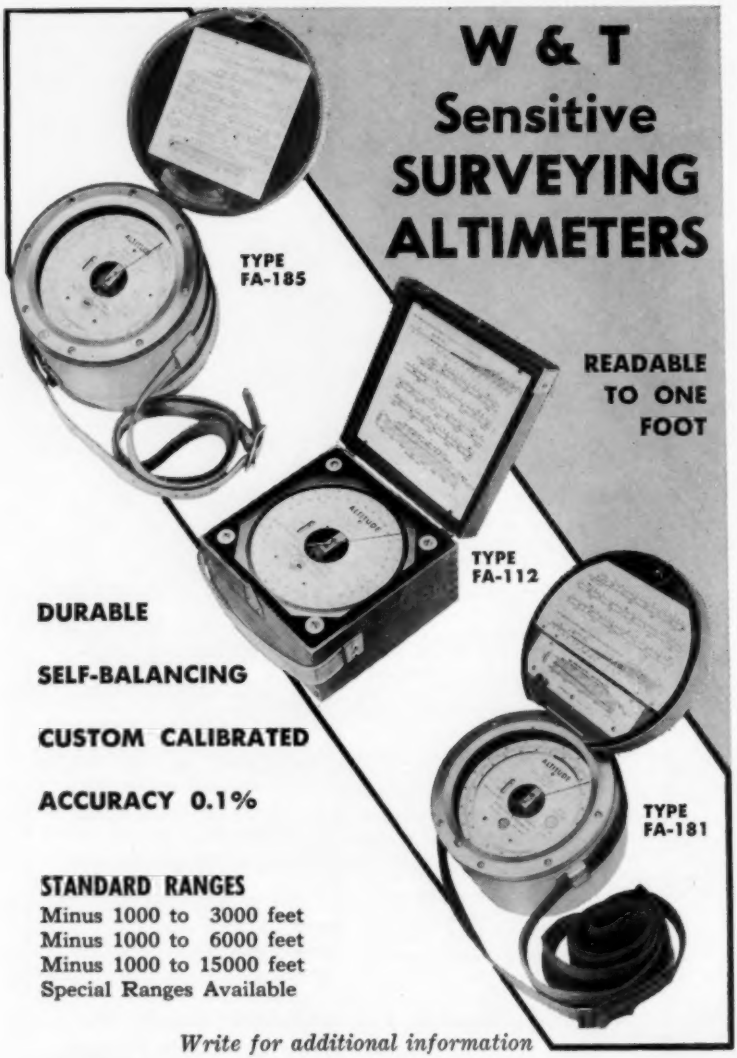
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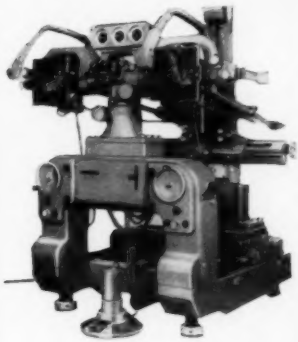

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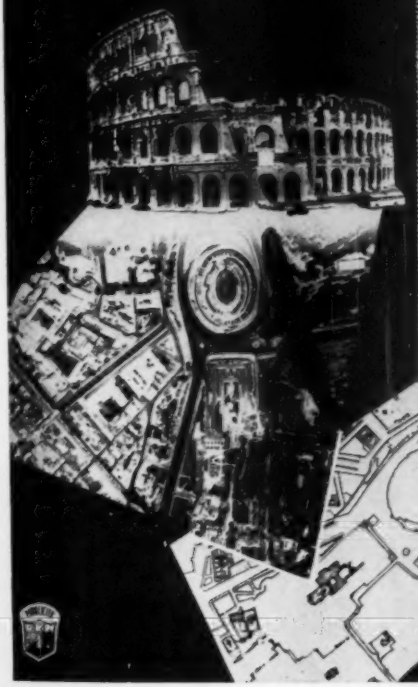

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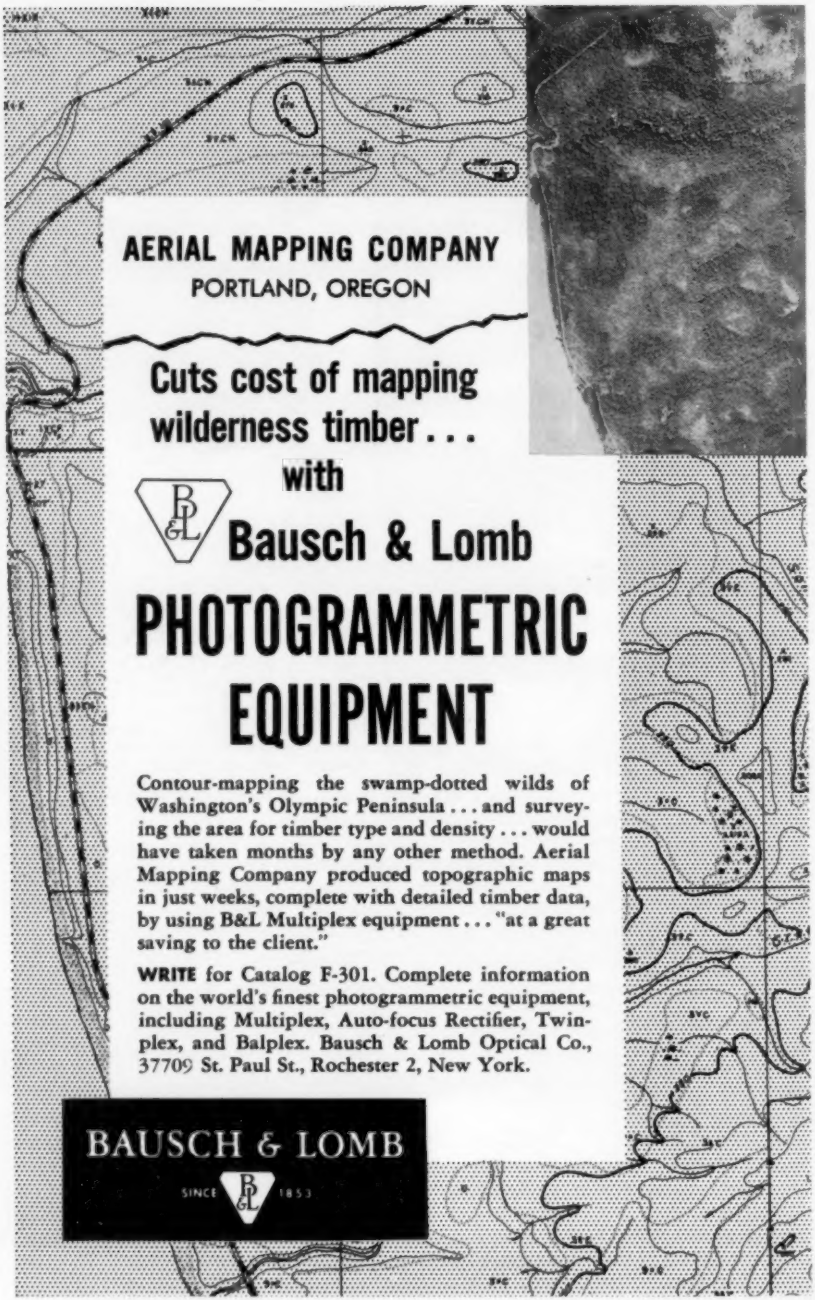

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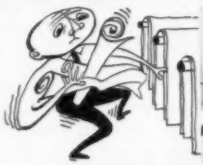

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(A Panel Discussion)

EDITOR'S NOTE.—The panel discussion presented below constituted the plenary session of the Education Division of the Sixteenth Annual Meeting of the American Congress on Surveying and Mapping.

The members of the panel are listed below, with ACSM Division represented by each panel member shown in italics immediately following the member's name.

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MODERATOR WEEDEN: Good afternoon, ladies and gentlemen.

A note of introduction with regard to the endeavor of the Education Division this afternoon might be in order.

We will attempt, in our program this afternoon, to disclose ways in which the Education Division might assist its members who are involved in the education of young men in the area of surveying and mapping to approach the problem from a professional point of view.

Yesterday, the Education Division concerned itself with the professional aspects of surveying and mapping, and certain items of the problems of education in the field of surveying and mapping were discussed.

At last year's Congress meeting it was brought out in the plenary session of the Education Division that the endeavor of the educator is to help the student learn to make evaluations in a way which would not be so much involved with technique or the mastering of the art of surveying, but would be in keeping with the gray matter he had to exercise or thinking he had to do to solve the problem; to approach the problem on a broad and professional basis.

What we would like to do today is to have some of the members of the Congress, who are involved in the various divisions, point out to us where we succeed and where we fail to do just this. This is an opportunity for the members of the Congress to tell us, the teachers, what is *wrong* with what we do and also give us a little bit of a boost by telling us what is *right* about what we do.

This program will be of benefit only as it becomes specific. We can indulge in platitudes and generalizations, but the thing we should indulge in is a critical evaluation of the work that is being done. So what we hope for is an honest and constructive criticism.

I would like to conduct this meeting in a somewhat informal manner. First, I wish to introduce the panel to you. As they say at the ball park, "You can't tell the players unless you have their names and numbers." We are not numbered, but I will identify the panel from the left to the right. You have the score card down there and I am not going to indulge in a lot of flowery introductions.

The order in which they are listed on the program will, in general, be the order in which they will speak, although it is not the order in which they are seated. The exception is that we are going to save our clean-up hitter for last. That is, we are going to have the privilege of rebuttal and save the educator on the panel for the clean-up slot.

(At this point the moderator introduced the members of the panel and called on Mr. Randall to present the first paper.)

CARTOGRAPHY DIVISION

MR. RANDALL: I do not know the purpose of my being on the far left of this program; I hope it did not mean I was going to be too radical.

Let me say first that last January, when I first saw the preliminary program for this meeting, I was highly pleased to see this particular subject scheduled for a panel discussion. I think the educational problem is of utmost significance to us, as it must be to all professions. So, I looked forward to hearing what the panel members would have to say on the matter.

But this feeling of comfortable anticipation vanished when I was myself asked to be the panel member from the Cartography Division. Only after assurances that I would not be flying the colors of the Division —would not, that is, be attempting to state an official Division position—did I accept. So, please add a mental footnote of the same kind the Navy ordinarily prescribes for me: the views of the speaker do not necessarily reflect those of the Cartography Division.

Now to the question: "What Teachers of Surveying are Doing Right—and Wrong." In my opinion, the biggest thing they are *not* doing right, despite all their good work, is teaching *enough* surveying! I believe that a profession that has reached the level of complexity and diversification of ours needs its own unified curriculum to prepare its members adequately for their work, and that we are unduly handicapping ourselves by not working toward this goal.

We are accustomed to saying that the ideal background for a professional in our field is training in Civil Engineering, and it is true that this schooling has usually been about the best available. But the survey and map needs of our country are changing. The changing requirements of transportation and of defense, and the increasing density and value of settled areas in America, make it a certainty that it is only a matter of time until we will require our universities to produce specialists thoroughly indoctrinated in our profession.

Even today, no successful operating official in any responsible position in our present commercial or governmental map and survey organizations can afford to be without a good deal of information about the many facets of his field: conventional and electronic surveying; new applications of astronomy and gravimetry to geodesy; precision navigation and height-finding systems for photographic aircraft; characteristics of mapping cameras and gyroscopic camera mounts; analog and digital computers for adjusting and computing ground and photogrammetric control; radar mapping; electronic survey plotting systems; map reproduction principles; and even some appreciation of color and design theory.

Few, if any, of us can claim the close acquaintance that we should with the items of this list. Do we intend to continue allowing professionals in our field to come to us educated so meagerly compared to the training they might have received?

I am making no plea for a trade-school education in how to adjust a first-order level network or operate Geodimeters and Steroplanigraphs. Such knowledges are best developed on the job. However, we should certainly try to ground our future professionals fully in the theory behind these things. Without such grounding, their mastery of the operating techniques must be a matter of rote, barren of the possibilities for full utilization and improvement of equipment and method. A profession so organized is in danger of losing its identity and of having its real advances come from the work of outsiders who are more competent and fer-seeing than we ourselves.

Of course, the university pondering the question of offering a specialized curriculum in modern surveying and mapping theory must consider the market. For a good many years this must continue to be a very real problem in most parts of America. Happily, the Ohio State curriculum seems to have taken hold and the Institute there must continue to receive our best hopes and good wishes. And here in Washington, where the concentration of professionals in

our field is so high and where the need for qualified young men and women is so great, we can hope that a fully accredited curriculum will one day supplant the highly commendable series of professional courses in surveying and mapping now presented by the Department of Agriculture Graduate School.

But neither here nor anywhere can our profession advance along this road unless we support the professors in our field in reaching toward our goal. Dedicated to our advance though they are, they alone cannot achieve even moderate curriculum changes. Broad official utterances of our Congress are of help to them, but of even more importance are contacts of surveying and mapping organizations with particular universities, and especially the recommendations of individual alumni.

If we as a Congress have any thought of organizing a true profession worthy of our hopes and continued active support, we can not afford to delay much longer the fundamental business of organizing a full and effective educational program geared to provide adequate training to those who will take up our work tomorrow.

INSTRUMENTS DIVISION

PROFESSOR NOTHSTINE: Members and guests of the American Congress on Surveying and Mapping and American Society of Photogrammetry:

We are well along in an active renaissance in instrumentation. Until about 1940, we were very content to teach the use of the compass, engineers level, vernier transit, tape, pins, plumb bob, and rod. In photogrammetry, the multiplex was the popular instrument.

Many believed that this instrumentation was not to be excelled. For good performance, one could have new issue of this equipment. For production, one could have many units operating.

The engineering professors of today were students in this school. We must look twice, lest we are teaching the same material as we had in school. In fact, we may be covering less material. Our curriculums are constantly being adjusted. Usually, the surveying is not expanded. We are seeking room for additions to our curriculums, sometimes at the expense of the surveying courses. Surveying is not alone in this respect. Further, geodesy and photogrammetry have been introduced into our courses, causing shortage of time.

Probably the greatest factor contributing to the limitation in stature of surveying in our universities is that surveying is taught as part of the work leading to the civil-engineer degree. The specification for the coures is then—what should a civil engineer know about photogrammetry and what should a civil engineer know about surveying? These questions are usually answered as somewhat subordinate, resulting in a very subordinate stature for the courses of surveying and photogrammetry and their instrumentation.

Surveying and photogrammetry deal with the science and technology of engineering measurements. Civil engineering is the only engineering which embraces surveying and photogrammetry. As the academic stature grows and is recognized and demanded, the problem of inserting all the necessary course work is increased. When sufficient student demand exists, these courses are introduced.

The greatest wrong that a surveying teacher can do today is to teach the same course material he had 20 years ago. It is true he had a good course then. It would take non-interest, non-membership, and nonparticipation in scientific and technical societies such as ours to be uninformed of the renaissance in this field. This renaissance is due to the demands of civilization and is afforded by the development of instrumentation. Students under such a teacher are betrayed and realize it later when they discover the real condition of flux that prevails. If the "new" did not exist, only then could such a plan be endorsed.

Another great wrong is for the teacher to enjoy a "helpless" attitude. When he cannot obtain advanced instruments, he should not resign himself to inactivity and a "what's the use" attitude. Here is real challenge. The answer is undaunted enthusiasm for

partial solutions found through the medium of graphic arts and especially amateur photography. The profession is not clamoring for highly experienced technicians from the universities. The profession expects men of academic stature, that is, well founded in the theoretical principles for practical analysis. At times, if the equipment were available, we would be hard pressed to provide time for student operation.

The teacher should avoid buying "all alike" equipment. This could have a standardization value, but it would be a handicap for educational benefit.

Administering a course, requiring instrumentation, with "form problems" and "blue print" answers may well be one of the great losses charged to the course. The important point is to educate the student to the philosophy of an "observer." As such, he must develop a keen sense of limitation for the combination of instrument and observer.

The teachers who are doing "right" things are to be commended. The formula may seem complex. Yet, it is developed with a simple continuity.

The teacher becomes interested. He obtains membership in our technical societies, local and national. After participation, comes enthusiasm for a resolute purpose. He now finds access to the contemporary work, theoretical and applied, of others in our field. The new developments in instrumentation are reported. If he is fortunate he may attend the Annual Joint Meeting of the American Congress on Surveying and Mapping and American Society of Photogrammetry to see the instrument displays. This is elevating to the stature of the professional teacher.

We must transfer information and ideas to students and associates. We can obtain literature, pictures, and an occasional piece of equipment. The teacher may work under many handicaps that vary with his environment. These are overcome by the resourceful. They are not satisfied with a "helpless" feeling.

Resourcefulness is the fruition of our joint meeting. The theoretical and applied are linked together with instrumentation. Each are the subject material of the meetings. They are cemented together with the association and even fraternity of our members.

The wrong exists in recognizing only old instruments—compass, engineers level, vernier transit, tape, pins, and plumb bob—as the complete instrumentation for a course.

The teachers in the right are giving an introduction to recent developments. Among these are instrumentation in photogrammetry, European optical-reading transits, optical methods for precision measurements, electronic applications, and wave-propagation applications. It is early to determine all the changes in elementary and advanced courses. The professor must introduce the new in the appropriate places. The texts are revised as rapidly as possible but shall always be a phase behind and incomplete. Thus the rightful place of the professor is recognized.

MODERATOR WEEDEN: One would hardly realize that Leo speaks out of both sides of his mouth; as both representative of the Instrument Division and as an educator as well.

You did a good job, Leo. Paul, will you take over?

MR. RICE: Before I present this paper, I think you ought to know a few facts about Mr. Clarke.

He is a graduate of Cooper Union and is a senior partner in the firm of Clarke and Hartman, one of our prominent civil engineering and surveying firms in the Hudson County area of New Jersey. He is chief engineer of the city of Jersey City, which is the county seat of Hudson County; a past president of the New Jersey Society of Professional Engineers; and a past director in our Land Surveys Division of that society. He is also a commissioner on our State Board of Professional Engineers and Land Surveyors and at the present time is the leader in our group investigating the examinations and other requirements for land surveyors in New Jersey.

Ladies and gentlemen, these are the thoughts of Mr. Clarke in answer to the question: What are teachers of surveying doing right and wrong, from the viewpoint of the Property Surveys Division?

PROPERTY SURVEYS DIVISION

At the outset, I wish to state that from the point of view of the property surveyor, the educator has had very little to do with a large percentage of practitioners in this field since they have been developed by the pupilage or apprenticeship system. The reason for this situation may have developed from various factors, among which, probably the most outstanding is the sparse economic outlook for the young surveyor. A word of explanation as to what is meant by the sparse economic outlook is simply that the graduate civil engineer, who may have had an approved surveying course in his curriculum, finds the immediate financial offerings in the field of engineering far more attractive and lucrative than those in the surveying field.

In defense of the practicing property surveyor, let me say that the average college graduate who has had a course in surveying is not equipped to be of much value to him, because the courses have not kept in step with and been expanded to cover thoroughly the new fields. This, then, might be my criticism: Educators are providing the right education for surveyors but not enough of it. In talking with educators I find that they cannot allot any more time to surveying in their civil engineering curriculums without doing serious harm to their primary engineering course.

The expanded requirements for the surveyor would be appreciated by a review of the "Interim Report of the Task Committee on the Status of Surveying and Mapping" by the Surveying and Mapping Division of the American Society of Civil Engineers.[1]

Most of you have read this report which came out on October 24, 1955, under the guiding hand of Brother B. Austin Barry, F.S.C., as Chairman. This among other things points out the important role photogrammetric and electronic measuring devices are assuming in the field of surveying.

A review, also, of the report of the Committee on Land Surveying of the National Council of State Boards of Engineering Examiners, dated October 22, 1955, points up the expanding field of the surveyor. I quote an excerpt of the report apropos of my thinking:

"The task of educating and training a qualified land surveyor is harder than it was a generation ago. Engineering colleges have deleted from the curricula all or most of the material that related to land surveying, and there are very few qualified land surveyors who can, or will take time to teach apprentices."

I would like to incorporate in this presentation the Qualifying Examination, as suggested by this Committee, but it would use up too much time. Suffice it to say that these requirements could not be met by most of the present courses in land surveying in our colleges.

What, then, can our educators do to help this situation? I think that they should consider the following as possible solutions to this problem:

(a) Whether a course of training in land surveying be provided only as a graduate course for Bachelors of Civil Engineering or the equivalent; or

(b) Whether a separate degree course of Bachelor of Science in Land Surveying with associated civil engineering subjects be established.

There seems to be general agreement among civil engineers and land surveyors at grass-root levels that it is necessary that the educational facilities and standards for the professional surveyor should be improved; that there should be a higher level of training than that given by the present "sandwiched" surveying course in civil engineering; and that to develop the profession it is necessary to produce graduates highly competent in geodetic, photogrammetric, topographic, and cadastral surveying.

The thinking among educators in Australia and Africa is far ahead of ours in this matter. Recently I communicated with the New South Wales University of Technology, in Sydney, and I was amazed at the progressive steps they had taken in this direction. They have a degree course leading to a degree of Bachelor of Science in Land Surveying—a four year course. Other universities also giving degree courses are as follows:

[1] *See* Proceedings of the American Society of Civil Engineers, Vol. 82, No. SU1, March 1956.

University of Queensland
University of Melbourne
University of Cape Town
University of Western Australia

These colleges have established land-surveying courses leading to a degree for both day and evening courses, and I think it worthwhile to list the following table which shows the subjects and the time alloted:

SUBJECT	COURSE DAY Hours	COURSE EVENING Hours
Mathematics	396	370
Physics	372	351
Geology	72	68
Surveying	288	221
Geodesy	155	134
Photogrammetry	160	160
Astronomy	145	138
Land Utilization	48	68
Survey Computations	156	139
Survey Law	48	56
Land Evaluation	34	34
Map Projections	48	44
Map Reproduction	18	20
Town Planning	48	48
Descriptive Geometry	84	51
Plotting and Plan Drawing	96	85
Geophysics and Geomagnetism	68	68
Humanities	171	130
Total	2,407	2,185

On the other hand, an educator once told me that, if the requirements of the National Council of State Boards of Engineering Examiners were to be strictly adhered to, he wondered if we would have any more licensed land surveyors after the present members of the profession have passed on to a better world. It was his opinion that the majority of our land surveyors will continue to come up through the ranks the hard way rather than having the advantage of a college training. This same attitude could have been taken when the various phases of civil engineering were broken down into mining and geology, and eventually, mechanical, electrical, etc.

It is my opinion that only a minority of the civil engineers will object to the upgrading of surveying, feeling that the course will turn out "pseudo civil engineers." However, whether we like it or not, surveyors in many fields are being employed on engineering survey work. A man trained in engineering subjects and "majoring," as it were, in surveying, will be thoroughly trained in those phases of civil engineering in which he professes knowledge and is comparable to a man who takes a degree in applied geology.

Another angle to which the property surveyor is being rudely awakened is that economically he is on the brink of losing part of his birthright because the field of photogrammetry and town planning is being monopolized by commercial photographic outfits who daily advertise, in newspapers, magazines, trade papers, and even in our own technical publications, the advantages of aerial mapping for public planning of turnpikes, highways, and land developments, for city planning, and for tax maps. This is big business, totalling in the millions, which I am not disparaging nor belittling, but I do say that this should be the tool of the engineer and the land surveyor and not the reverse, as is the case. It is a striking example of the tail wagging the dog.

If the engineers and surveyors were educated to this vista of vast accomplishments within their grasp, we would have the financial wherewithal to offer starting salaries to the land surveyor, coming out of college with a degree, comparable with the other branches of the engineering profession.

And last but not least, I say that it should be the determination of all engineers and surveyors to upgrade the surveying profession, which, in this country, we proudly point out is the heritage handed down from George Washington; and to add lustre and strength to one of the most unique and distinguished professions. Referring again to Brother Austin's A.S.C.E. Task Committee report, it is appropriate to cite one paragraph of the definition of the term "professional" as given in the language of the Taft-Hartley Act of 1947:

"Requiring knowledge of an advanced type in the field of science or learning customarily acquired by *prolonged course of specialized intellectual instruction and study*

in an institution of higher learning, as distinguished from an apprenticeship or from training in the performance of routine mental, manual, or physical processes."

In conclusion, I propose that our educators in this country appoint a committee to investigate the establishment of a degree course known as Bachelor of Science in Land Surveying.

MODERATOR WEEDEN: Thank you, Paul, for a very able job. Mr. Kennedy, will you carry on.

TOPOGRAPHY DIVISION

MR. KENNEDY: I hope that the surveying teachers will not feel as though they have been singled out to bear the brunt of what appears to be a common activity of the American people on the whole subject of teaching. Certainly, we have heard much on the subject, covering grade, secondary, and college levels, and in some instances going into the graduate field.

Our concern, and therefore probably the why of this panel, is our close working association with the subject. We have not only the opportunity of evaluating the student, the course of the study, and the instructors, but also of observing the use of surveying and mapping with other engineering studies for the speedy and economical solution of the major construction problems.

All of us are aware of the vast increase of this activity during the past ten years, and it is still accelerating. To bring about a better solution to the present problems, this panel might be able to start a chain reaction that will require the help and cooperation of the colleges and the surveying and mapping specialists.

The present trend to cut down on the hours of instruction in surveying in the face of an increasing need for more and better instruction is certainly hard to reconcile. True, there is demand for other courses within the civil curriculums which opposes time devoted to surveying, but surveying is fundamental to "civils." It's time those charged with the responsibility of setting up the requirements for "civils" reconsider their basic mission. We cannot blame the surveying instructor for the time allotment to the subject he teaches. We can blame him for poor management of his classes.

A recent solution that seems to keep popping up from time to time concerns the subprofessional or the technician. Those who think of surveying in terms of the old-time surveyor with his compass and staff are correct in their assumption that this type of activity is not professional—that they are thirty years behind in their thinking has never occurred to them. It is true one does not need a professional for reading an instrument. In fact, most jobs can be broken down into components where even the least talented can perform. Surveying and mapping are not unique in this respect, but colleges cannot shrug off the subject by referring it to the high schools or technical schools.

After interviewing eighteen young graduates and obtaining opinions on the subject from seven instructors, their comments can be expressed as follows:

Students' View

The eighteen students who were interviewed had the following opinions regarding their undergraduate surveying instruction, fourteen of them feeling that instruction was inadequate. The course content of those interviewed varied from nine to thirteen semester hours. Main objections:

1. Classes too large—too few instruments.
2. Lack of experience in both instructors and student assistants.
3. Lack of experience and theory in student assistants.
4. Lack of knowledge about modern concepts.
5. Teaching left impression only field methods were used.
6. By grading all members of the survey party the same, there is a tendency to allow some to drift along and let others do the work.
7. Running same field problem year after year allows too much room for cribbing and copying older papers.
8. Some felt the course made good rodmen but poor instrumentmen.

Comments from Teachers

1. Too many, when asked for their opinion, hedge questions and feel they would be making a self appraisal.
2. Failure to accent the importance of good sur-

veying data and high quality maps in the practice of civil engineering.

3. Few are acquainted with availability of aerial photography which could assist in site selection and other engineering problems.
4. Salary problems—difficult to get and hold good teachers.
5. Some are outspoken in resisting cuts in surveying courses and feel certain the time will come when highway departments, railroads, county and city agencies, and State and Federal agencies will feel the pinch.

Good instructional practices, of course, are those in which the teacher is devoting as much time as allowed to the fundamentals: trying not so much to make practical technicians out of the students as to give them the broad picture of how surveying fits with the other specialties; giving them a better picture of the instruments used and their application to the problem at hand; calling their attention all the time to the fact that each project will have its own problems to be met on the ground.

It would take more time than I have to indicate what should be done. However, for a start I suggest that we inform the department heads of the various colleges of our desires and needs. Some of our recommendations should go directly to the A.S.E.E., which develops the contents of the average accredited college course. We should try to show the faculty and the students the new techniques, instruments, and other points of surveying and mapping as they develop. We should stress the importance of survey data in the solution of engineering problems. We should make available on-the-job training for college instructors to bring them abreast of modern practices.

Government and private surveying organizations should try to relate their survey requirements to the needs of the project; particularly those in private industry, which needs a new set of standards and specifications for large-scale surveys. The statement that national standards of accuracy are met is not enough. The civil engineering field has grown and so has surveying—but I have no patience with those persons who would advocate separation of the two. True, there is a strong emphasis on the glamorous fields of nuclear physics, electronics, and chemical research, and it is only natural to see the undergraduate in civil engineering leaning toward subjects that will enable him to enter these fields. The result is very apt to be a partially trained individual, not well versed in his own field and wholly inadequate to compete with the specialists in the other fields. There are more than just the teachers of surveying who need guidance.

MODERATOR WEEDEN: Thank you, Mr. Kennedy, from the bottom of my heart. You really called the shots just as I like to hear them called.

Mr. Morse, please.

CONTROL SURVEYS DIVISION

MR. MORSE: I might say at the outset that my remarks are concerned primarily with surveying education as I know it for a limited segment of the southwest, including only a few of the engineering colleges I happen to be acquainted with there.

Surveying, as taught in most of the schools of engineering in the southwest, has been increasingly relegated to the basement of the engineering curriculum. With few exceptions, the courses are limited to the sophomore level. More often than not, young instructors, with no special qualifications for or interest in the assignment, are given the rather onerous task of serving their teaching apprenticeship in surveying. Heads of college civil engineering departments are prone to regard surveying as a vocational adjunct rather than a legitimate professional branch of civil engineering, and this attitude is widely shared by the students themselves. Surveying, they feel, is a trade and not a profession, and one that is rather poorly paid at that. The result is that probably not one engineering graduate in a hundred has any intention of undertaking surveying as a career. With this said, it would only be fair to point out some of the brighter aspects of the surveying education picture and try to place the blame for most of the shortcomings where it properly belongs.

In some of the colleges in the southwest

there are one or more dedicated individuals who, despite rather formidable odds, succeed, through their energy and enthusiasm, in making the most of the limited time available to them with students and in getting across the important message that modern surveying technology can be a highly useful engineering tool. Frequently, such individuals have had no special training in surveying. They are of the type who would have done their best in any role assigned to them but, by reason of having done well there, they have been kept in surveying teaching. The surveying profession owes much to these individuals.

From the standpoint of control surveys, the average young C. E. graduate has more to offer and less to "unlearn" than would be the case in some other branches of surveying, particularly that of boundary work. He has learned something of the principles of survey control and has most of the mathematics with which to master it with a minimum of training. Perhaps his best asset is the mental discipline that goes with a rigorous engineering education.

It seems to this observer that the major blame for the decline in interest in a thorough college training in surveying can be attributed to simple economics. While the demand for engineering graduates in practically all fields has had a spectacular increase, the individuals who do specialize in surveying in the relatively few colleges that offered advanced courses have a much more limited field to choose from. We need to look no further than the want ads of the newspapers to see why engineering students feel justified in taking a dim view of surveying as a profession. Also a factor is the large number of surveyors in private practice who have a limited technical education and place a relatively low value on their services.

A steady increase in land values along with the need for greater precision and efficiency in surveying methods are factors that are beginning to exert some influence in our colleges. The acquisition of at least some surveying equipment of advanced design by most engineering schools is a hopeful sign. The placing of surveying instruction in the latter two years of the civil engineering curriculum could have some beneficial effect. The engineering graduate should place a higher value on such instruction and be less likely to forget it before he has an opportunity to use it.

With the decrease of time available for the teaching of surveying of all categories an established order in most of our engineering colleges and a steady advance in the technology of surveying taking place despite this trend, teachers necessarily must put more emphasis on the *why* of surveying techniques and less on the *how*. In brief, what some teachers of surveying are doing right is to stimulate the enginering student to exploit and advance modern surveying. Conversely, what other teachers are doing wrong is to give text book and field assignments in a routine and unimaginative manner.

The impetus for a renaissance of surveying in all branches can be (and, indeed, is being) provided by ACSM. If the knowledge of what can be accomplished by the employment of modern surveying methods can be properly sold to enough people who manage engineering departments in major industry, the demand for adequate surveying instruction in our engineering schools will supply most of the answers to the problems of surveying teaching.

MODERATOR WEEDEN: Thank you, too, Mr. Morse.

Now Eldon, you heard what the men said. Let's see what you can do in defense of the educators, and we have quite a few of them out there in the audience to hear what you can say.

PROFESSOR WAGNER: I would like to open this with just a brief remark before I get into the paper.

I was given ten minutes for this; I believe it was put as rebuttal. Obviously, in ten minutes I could not answer these points individually. As a result I have to generalize. In generalizing I may have over simplified, which is all right except there is always danger of misunderstanding when we over-simplify, but I hope in cross-examination afterwards that I may get a chance to comment on a few of the things that have been said.

EDUCATION DIVISION

I was much interested and also personally encouraged by the papers just given, criticizing instruction in surveying and mapping. I sometimes feel that the educators are the only ones interested in the work they are doing. The encouragement comes from the realization that those people practicing in the field of surveying and mapping have a deep and sincere interest in the educational aspects. I believe that most teachers of surveying and mapping would agree with the criticisms made, and I feel that they were well chosen. I will take exception to a few.

If teachers of surveying and mapping are dissatisfied with the curriculum the question arises: Why don't we do something about it? In my opinion, there are two principal reasons: (1) an already overcrowded curriculum in civil engineering; and (2) lack of sufficient student interest in surveying and mapping as a major field. Let us consider each of these separately.

Some civil engineering schools require 5 years of undergraduate work, but the majority have only a 4-year requirement. In this 4- or 5-year period, we are supposed to teach the student his basic mathematics, sciences, English, and humanities, as well as to train him in all the fields of civil engineering, such as structures, transportation, hydraulics, sanitary engineering, route location, surveying and mapping, municipal engineering, and perhaps a few more. After World War II, there was added to this problem the increased number of students taking reserve officer training in college. At the same time, there was increased pressure put on the engineering colleges to include more humanities courses in their curriculums. These have reduced the already limited number of elective credits available to the civil engineering student. If we add to this the ever-increasing amount of new information in all fields of civil engineering, it can readily be seen that engineering colleges cannot produce finished professional men in a 4- or 5-year curriculum. This, of course, is true in any profession, and we should not fail to recognize it in surveying. The best we can hope to do is give the student some basic knowledge with which he can work, develop his ability to analyze a problem, and give him confidence to go ahead with its solution.

In analyzing the curriculums of 13 major civil engineering colleges, it was found that the breakdown of credits in various subjects as to their percentage of the total number of credits required for graduation was approximately as follows:

SUBJECT	% OF TOTAL CREDITS
Mathematics	12
Physics	7
Chemistry	5
English	6
Drawing	4
Surveying and Mapping	5
Route Location	3
Geology	2
Soil Mechanics	2
Mechanics	8
Structures	8
Transportation	3
Hydraulics	4
Sanitary	3
Thermodynamics	2
Electrical Engineering	3
Economics	2
Humanities	3
Electives	10
Miscellaneous	8
Total	100

As is often the case, you can make figures prove most anything that you would like to believe. However, I believe this does indicate that the credits allotted to surveying and mapping are not as unfavorable as we are often led to believe. I have served on committees studying civil engineering curriculums for approximately six years, and I can assure you that *all* fields in civil engineering feel they have too few credits allotted to their courses. We do have the disadvantage that was previously pointed out, that surveying credits are usually given in the freshman and sophomore years.

If sufficient time and credits are not available in civil engineering for surveying and mapping, the first obvious solution is to introduce a separate curriculum in surveying and mapping. This brings us to the second problem facing the educator, the lack of a

sufficient number of students interested in entering surveying and mapping as a major field.

A school must justify its requests for funds and must spend those limited funds where they are most needed. One of the most convenient gauges for the allotment of funds is the number of students served. This does not create a serious situation in the basic required surveying courses. In the advanced courses given on an elective basis, however, it is difficult to get sufficient enrollment to justify the cost of giving the courses.

Let us now consider why more students are not interested in surveying and mapping. The most difficult decision the young student has ever had to face is that of choosing his major field of study in college. It is difficult for him because he has little knowledge of the fields from which he has to choose, and yet it is a decision which he must make himself, and it is one that will affect the rest of his life. What will he base this decision on? He will initially choose that field which he believes he will like the best—the one for which his aptitudes best qualify him, the one which offers the best opportunity for employment with the best monetary returns. After he has made this initial choice and has entered a particular college, his choice of elective courses, limited as they are in civil engineering, is greatly influenced by the stature, character, and personalities of the individuals who teach the subjects. The better students are further influenced in their choice by the financial aids available to them in the form of scholarships, fellowships, research grants, and so on, at both the undergraduate and graduate levels.

I believe that surveying and mapping is at a disadvantage on many of these points. This we must correct, and I believe it can be and is being corrected.

If we accept the overcrowded curriculum and the lack of student interest as the two basic problems we must meet, what can we do about them?

In regard to the overcrowded curriculum, I am not one who advocates a separate degree in surveying and mapping, because I believe that in the over-all picture the field is not broad enough, nor the demand great enough, to support it. I feel it should still be taught as a part of civil engineering and its application to civil engineering problems emphasized. This was also pointed out by Mr. Kennedy. The courses given and the demand for them must grow together. When these grow to the point where the demand justifies it, we should then have a separate curriculum in surveying and mapping. In my opinion, that point has not yet been reached.

It was gratifying to hear the previous speakers talk of the necessity for cooperation of the employing agencies with the educators. Both the students and the faculty can be greatly assisted by this cooperation. I feel this is particularly true of the influence exerted on both students and younger faculty through summer employment in surveying and mapping. Industry has recognized this for many years, and it was one of the first steps taken to meet the strong competition for engineering graduates. I feel that surveying and mapping is backward in this respect.

In conclusion, I would like to say that while I am not satisfied with the present status of surveying and mapping in our educational system, I am not discouraged. I feel that we started on the upgrade several years ago, and I am very optimistic about the future.

MODERATOR WEEDEN: Thank you all, the panelists.

I might also say at this time that a great deal of thanks for this program is directed to Brother Barry, who did the spade work in setting up this panel. Brother Barry is outgoing chairman of the Education Division and actually conducted what would be considered volumes of correspondence in order to bring together this group you see before you.

The actual time by the clock is such that we are running overtime; however, if there are some people in the audience who feel a burning desire to make a contribution on this subject we would certainly be happy to hear from you.

Prof. McFarlane, University of Michigan.

PROF. McFARLANE: I was a little disappointed in not hearing a little more emphasis upon the general philosophy of education and a little less emphasis upon the special philosophy of education for surveying and mapping.

I am one of the old-fashioned school, perhaps, who believes that orderly and systematic thinking is important for surveying and mapping, and important for civil engineers, mechanical engineers, and so forth. I am also one of that school who believes that the subject of surveying—making observations of a very heterogeneous sort of superficial things and correlating and systematizing them in an orderly process of thinking—is very important to any field of engineering. I would like to take the point of view that, instead of surveyors feeling that they need help or relief from the abuses they suffer from civil engineering and so on, they, because they are dealing with a natural subject, a subject that is natural for developing orderly thinking, serve as missionaries who would be concerned with helping out the poor civil engineers and other engineers in better orderly thinking.

PROF. SCHNEIDER: I am from Lehigh University. I was glad to hear the comments about the need for some of these specialties in surveying as far as taking care of the need for knowledge in electronics and the use of some of the new equipment.

I am aware of the difficulties of financing this equipment that must be purchased or in some way obtained to do this. It occurs to me that industry has to step in and help to fill the breach, as they have in so many educational needs in recent years. I have, in a small way, obtained cooperation from surveying equipment manufacturers in obtaining certain high priced items of equipment; also in getting some of their personnel to come in and do some special lecturing on some of the more unusual features of the surveying course.

I believe both the government and industry can very properly be called upon to help out on this matter of supplying the know-how as well as the equipment which a school cannot, within its ordinary budget, acquire and yet needs for a relatively small portion of the time.

MODERATOR WEEDEN: Thank you. One thing that has been alluded to rather indirectly and which I think can stand some clarification is that we educators are somewhat in the hands of the Engineers Council on Professional Development.

The Engineers Council on Professional Development has recently made a rather basic evaluation with regard to how surveying fits into the basic sciences and how it might be evaluated for credit.

If this group wishes to speak up and be heard in the councils of the mighty, I would suggest that the remarks of the panel, as they have been put forth today, be directed toward the Engineers Council on Professional Development in that it is perhaps there they will carry the greatest weight.

Are there other remarks from the floor?

If not, I declare this session adjourned.

Thank you very much, ladies and gentlemen, for your attention.

Plane Coordinate Intersection Tables

Publication of two more plane coordinate intersection tables has been announced by the Coast and Geodetic Survey, Department of Commerce. The States covered by these latest publications are Kentucky (Special Publication No. 341, 40 cents) and New Mexico (Special Publication No. 344, $1.00).

These tables contain plane coordinates for 2½-minute intersections within the limits of the State, based on the plane coordinate system established by the Coast and Geodetic Survey.

Copies of these publications may be obtained at prices quoted above from the Superintendent of Documents, Washington 25, D. C.

Sea-Going Base Lines Control Sunshine Skyway in Florida

By PETER A. HAKMAN
ASSOCIATE OF PARSONS, BRINCKERHOFF, HALL & MACDONALD

INTRODUCTION

The Sunshine Skyway crossing lower Tampa Bay in Florida has already become somewhat of an institution to the West Coast of Florida. After its opening in September of 1954, this facility quickly became a very popular attraction for the tourist and sportsmen, as well as serving the many resident and commercial interests with a much-needed highway crossing. Traffic and revenues from this toll project have already exceeded the engineering predictions and the facility promises to be an outstanding success for the State of Florida.

From the engineering standpoint, construction of the Sunshine Skyway presented many unusual and challenging problems as would, of course, be expected of a project costing about $21,250,000 and crossing eleven miles of open water. Included were such problems as the very unusual geology and foundation conditions of the site; the exposure of the location with the many complications to construction; the extensive use of the relatively new concept of prestressed concrete construction; special techniques employed in the erection of the steel superstructure as floating complete spans into final locations; and the task of providing accurate survey control for such a long water crossing. The survey control should be of special interest to the readers of this publication and will be discussed in detail.

A general concept of this project is given by figure 1 showing how the City of St. Petersburg is connected by U. S. Highway 541 to a point several miles north of the cities of Palmetto and Bradenton, Florida. From Maximo Point at the northern extremity, the work extends south and east to cross about 11 miles of open water of Tampa Bay to the shores of Terra Ceia Island, thence a two-mile crossing of the Island through mangrove swamps and lowlands, a half-mile crossing of Terra Ceia Bay, and finally about a mile and a half of roadway to the present main highway. The portion presenting the real control problem was the 11-mile water

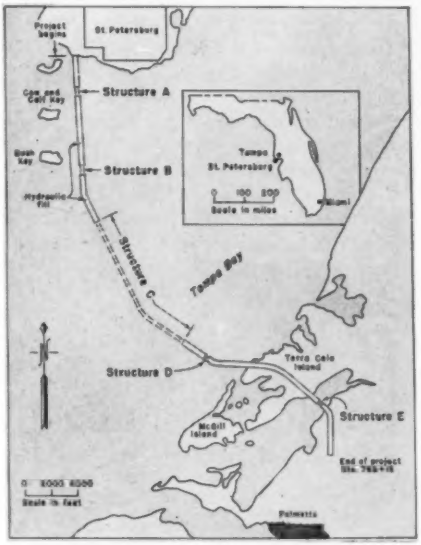


FIGURE 1.—The extent of the project.

crossing of Tampa Bay which has been spanned by five sections of hydraulically placed embankment and four bridge structures. The central bridge, Structure C, is made up of 5,856 feet of trestle construction on the north, 5,621 feet of high-level bridge crossing the main ship channel, and 10,896 feet of trestle construction to the south—a total of about 4½ miles of bridge.

As is typical of this type of crossing, it became necessary to develop a survey-control system to serve first for the preliminary work —for the preliminary alignment, subsurface borings and index piles—and later for precise pier location throughout the construc-

tion period. For the preliminary phase, a system capable of locating a drill rig within a "few feet" was adequate; for the construction phase, an elaborate network was necessary to enable spotting bridge piers to fractions of an inch—actually better than first order accuracy. Even a "few feet" was a comparatively small target out on 11 miles of open and seldom calm water. Also, since the preliminary work had to be completed in a relatively short time, this phase of the work in itself was quite a task.

PRELIMINARY SURVEYS

In addition to the usual alignment data needed for design purposes, a program of 75 subsurface borings and 58 index piles of various types was planned. With the limited time available, it was apparent that measured base lines could not be attempted on which to establish even a simple triangulation network for the horizontal control. The system shown in figure 2 was adopted,

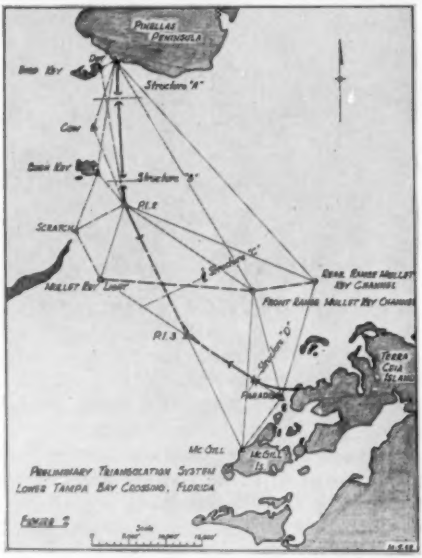


FIGURE 2.—The preliminary triangulation.

utilizing three existing aids to ship navigation—towers known as Mullet Key Shoal Light and Front and Rear Range Mullet Key Lights—which previously had been triangulated to by the Corps of Engineers and coordinated to about third order accuracy. Other stations were available, some coordinated by the U.S.C. & G. Survey, but, since the precision of most of the work was third order, it soon became apparent that to involve too many stations would unnecessarily complicate our immediate problem and probably not lead to any greater accuracy. Hence the three points were adhered to, leading to two calculated base lines about which was evolved a simple triangulation system.

Angle observations were made with a T-2 direction theodolite reading directly to one second and to tenths of a second by estimation. Time did not permit the erection of elaborate towers over triangulation points to occupy and sight on for these observations. However, the system was closed and used for location, with practically all of the observing done during daylight hours and with a reasonable accuracy—about third order. In general, the system proved adequate for our needs, although it must be admitted there were days when the location of a boring or pile-driving rig appeared to be an impossible task. Spotting small floating equipment out of a very rough and hot Bay from triangulation points as much as 8 miles distant presented some very discouraging problems.

CONSTRUCTION SURVEYS

The horizontal control system for the construction stage had to be capable of locating such positions as centerlines of piers to within say 0.02 of a foot and this to be done in a reasonable time, often under adverse weather conditions. The main problem resolved itself down to the 8-odd miles of water crossing between Mullet Key and its shoals to the north and Terra Ceia Island to the south. Structures C and D were constructed in this area and Structure C, being about 4½ miles in length, required the real refinement. Control work for Structures A, B, and D was of no great consequence and will not be discussed in detail. Structures A and B, about 1500 and 1700 feet long, respectively, were treated as small independent systems and presented no major problems.

It appeared that the most logical and strongest triangulation network for the main crossing would require two base lines located as illustrated in figure 3: a north one from the tip of Mullet or Scratch Key, along a shoal to the northeast where water depths averaged 2 to 3 feet, and a south base line

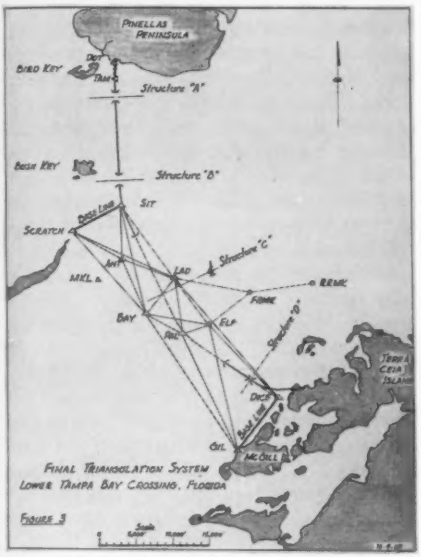


FIGURE 3.—The final triangulation.

extending between Paradise and McGill Islands along which line the water was relatively shoal except for about 2000 feet ranging from 6 to 12 feet in depth. Between these two base lines, a network was established with control points in strategic positions, some at tangent points in strategic positions, some at tangent points of intersection and others adjacent to bridge centerline, so located as to give strong intersections for pier spotting. These points were also located to minimize the sight distances to piers to about 4000 feet.

Such a system on paper appears to be very nearly ideal from the standpoint of mathematical strength of the network and effectiveness and convenience for construction purposes. However, it would be unfair to overlook the many practical problems encountered—problems resulting directly from the local terrain and weather conditions in the Tampa Bay Area.

Lower Tampa Bay at the site of the crossing presents about 11 miles of clear water, unobstructed and often treacherous. Much of this is shoal, particularly the section north of Scratch Key where depths are frequently 3 to 6 ft. The deepest water occurs at the main ship channel which Structure C spans —about 35 feet. Adjacent shoreline areas are generally dense, humid, rattlesnake-infested and insect-ridden mangroves—far from ideal for survey purposes. The local weather is semitropic with extended periods during the summer of intense sunshine with temperatures consistently in the nineties and relatively light winds or glassy calm. From about July through November, the stormy season sets in, gradually increasing in intensity from occasional sudden rain squalls to several violent squalls daily. Superimposed on this is the serious threat of hurricanes during this stormy season—hurricanes which are not supposed to strike this area but come so close that the difference is somewhat academic. Winter, of course, brings cooler weather, generally with stronger winds that hold steady for long periods.

All of these factors greatly complicated an already difficult problem. Some lines of sight were as long as 8 miles, over waters of various depths and temperatures and through variable winds, all causing a profusion of heat radiation. Long water distances also lead to complications in transportation and communication between survey parties. Rough waters made it difficult to maintain reliable survey control points and made necessary a "sea-going" variety of engineer as against the "dry-land" type. In general, the project probably typified bridge building at its very "best."

SEA-GOING BASE LINES

The two measured base lines presented the major problems since practically their entire lengths were over water. Yet, everything considered, the sites selected were the only logical ones in spite of the water. The south base line could perhaps have been run on land, but it would have meant hacking through jungle growth and mangrove

swamps—a task which was even less appealing than precision chaining in the water. Had this bridge crossing been constructed in a northern climate, perhaps we could have attempted the classic textbook approach of waiting until the waters froze and then chaining on the ice. However, the local Chamber of Commerce did not predict a severe winter and so we had our work "cut out." The base lines as finally established were about 7500 and 9000 feet in length, north and south, respectively.

The general procedure adopted was to measure each base line in sections of about 2000 feet, measuring and remeasuring each section until the necessary accuracy was obtained before proceeding to the next section. At the ends of each section, permanent monuments were established—points which could be relied on for several months, or at least until the base lines were satisfactorily measured. This was quite a task, especially on certain sections of the south base line where the water was 12 feet deep. Without the aid of heavy equipment, it called for improvising a large pipe A-frame with a drop hammer which was used to drive 4-inch diameter pipe into the bay bottom. At some locations, where the bottom was sandy, such pipe monuments were further stiffened with a concrete block poured in tremie fashion around the pipe and below bay bottom. Normal tides ranged from 0 to about plus 3.0 feet, thus requiring upwards to 20 feet of pipe in the deeper sections with at least 5 feet driven into the bay bottom. Between these permanent end monuments, intermediate points of 2½-inch pipe were driven at 150-foot intervals. It was not essential for these intermediate hubs to be as rigid as the permanent end monuments. They simply served as temporary markers holding a scribed measuring point on a copper strip for only the few minutes needed to measure to and from the hub.

The actual measuring was accomplished with a 150-foot "Lovar" steel tape and using suitable tension scale and thermometer. Tension applied was either 25 or 30 pounds. The survey crew worked constantly in the water or from skiffs or rafts, and the fact that equipment was always wet with salt water presented unusual corrosion problems and also required frequent check calibrations of the tape and tension scale. Also, working in the water or out of skiffs made it very difficult to make measurements without disturbing the pipe hubs. Work from the skiffs or rafts was the most difficult and was generally done by "spudding" the skiff securely in position with poles or pipes, well clear of the hubs before the measurements were attempted. One point that may cause some wonder is that the 150-foot tape was supported only at the ends, thus presenting considerable catenary and resistance to the wind. This was very true but was thought to be the lesser of two evils. Considerable time and energy were required to set pipe markers, whereas the actual time for measurement with ideal weather was small. It was therefore decided to dispense with 50-foot intermediate supports for the tape, get an entire section of base line ready, and then hurriedly measure it during ideal calm weather.

With this general approach, it was possible to measure the two base lines to a satisfactory degree of accuracy. Most sections were measured from 10 to 20 times to arrive at an acceptable mean value. The most probable error for the north base line was about 1:625,000; that for the south base line was much higher at 1:1,290,000. The accuracy as determined by comparing the measured length of one base line with its calculated length, figured from the measured length of the second base line carried through the entire unadjusted triangulation net, was about 1:600,000. The angle observations, as will be discussed next, were of greater accuracy than these base lines. However, under the difficult circumstances for measurement, the accuracy obtained for the base lines was thought to be the best we could expect.

TRIANGULATION NET

The next essentials to the control system as set up on paper were the towers. These obviously had to be substantial to withstand heavy wave action, had to be elevated about 20 feet to bring lines of sight above excessive heat radiation, and had to provide separate

towers for instrument and observers. Five of the towers were in water and three on land, and all were constructed during the preliminary stages of the project by the same contractor who drove the index piles. The water towers consisted of a center triangular steel portion of three pipe piles, prefabricated on shore with the cross bracing, located in position on bay bottom and spudded in place by H-piles driven within the pipe piles. The voids between the pipe and H-piles were then filled with gravel. This center steel tower supported an instrument trivet stand and sighting target. Outside of this was another tower, also triangular in plan, constructed with three clusters of timber piles, braced together and forming a deck area for the men operating the theodolite. These survey towers proved very satisfactory although our one chief concern was their ability to withstand the adverse weather. Throughout the four years during which they were exposed to many violent tropical storms and several "small" hurricanes, they remained undisturbed, except for one tower, "Lad," which apparently moved 0.06 ft. during one storm. Of course, the only way possible to ascertain any such permanent movement in these towers, particularly those in about 30 ft. of water, was to reobserve all of the angles in the network and compare them with the original and adjusted observations. This was somewhat like "pulling yourself up by your bootstraps." However, it proved very effective and we became confident that any movements of even 0.02 or 0.03 foot could be detected.

It was anticipated that angle observations from the control towers would be a very tedious job, as is so often the case, and yet we were pleasantly surprised. This phase of the work was completed in a relatively short time with most of the observations made during the daylight hours, generally morning or twilight. Resort to night observing was only necessary on one direction, thus avoiding the many difficulties of night transportation and communication on the bay and the confusion of the hundreds of navigation and shore lights, some fixed and some blinking, in competition with our own survey control lights.

SURVEY TOWER USED ON FINAL TRIANGULATION

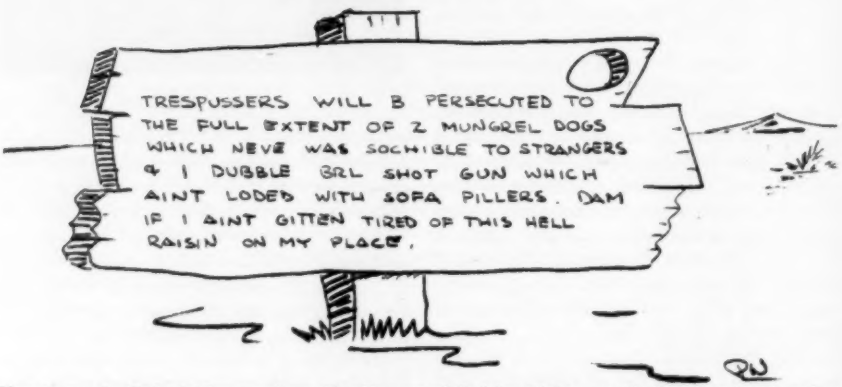
Probably the two greatest contributing factors to our rapid and accurate completion of this part of the work were the system itself, with its effective control towers, and the theodolite which was used—a Wild T-3. The T-3 instrument is a direction-type theodolite reading directly to tenths of a second, with possible estimation to a few hundredths of a second. It is a very accurate and fast operating instrument and proved ideal for our work. With it, the various directions were observed, using eight different initial positions on the horizontal circle, first with the telescope direct and then reversed, resulting in a set of 16 readings. This procedure was repeated at

least four times or as often as necessary to result in an acceptable mean value. As the work developed and it became apparent what accuracy we could expect, a basis for acceptance or rejection of observed angles was adopted. This criterion was to have triangle and quadrilateral angular errors of closures not greater than 0.5 second. The average closure of all figures before adjustment of the angles was about 0.28 second. Considering the many complications already discussed, especially the excessive heat radiation over the long water distances, we were more than satisfied with these results.

The final phase in the development of this survey control system was the adjustment of the observed angles by a least-squares method. Solution was by the "Doolittle method". From the network of twelve triangles, twelve angle, one length, and three side equations were set up for simultaneous solution—a total of sixteen condtions. The resulting adjustments to the various angles ranged from a maximum of 0.54 second to 0.00 second.

The Sunshine Skyway, now a completed reality, already gives one the feeling that it always has been there. The average tourist enjoying the Skyway's convenience and scenic beauty, or the angler catching the abundant fish from the bridge trestles, is no doubt unaware of such grueling problems as the survey control required for this structure. However, it will continue to be a great satisfaction to the engineers concerned that the project was completed at such a difficult location without any location errors greater than a fraction of an inch. Many townspeople often claimed we could not meet in the middle, judging by their "close scrutiny" from a ferry trip five miles distant. We can only state that we are thankful they were wrong.

BEWARE!


TRESPUSSERS WILL B PERSECUTED TO
THE FULL EXTENT OF 2 MUNGREL DOGS
WHICH NEVE WAS SOCHIBLE TO STRANGERS
& 1 DUBBLE BRL SHOT GUN WHICH
AINT LODED WITH SOFA PILLERS. DAM
IF I AINT GITTEN TIRED OF THIS HELL
RAISIN ON MY PLACE.

Sign at gate in Quingly Canyon about ¼ mile west of Quigley Siphon on the Los Angeles Aqueduct.

The drawing reproduced above was received from Robert B. Irwin, Los Angeles, Calif., and reminds us of that time when we were running flying levels for the Geological Survey in northern New York State and were accompanied up a lane and along a line fence by two farmers, two farmers' sons, two dogs, and two shotguns as we leveled in an attempt to cut a big circuit in two.

—EDITOR

Proposed Map Symbols for River Boundaries

By ABRAHAM M. HIRSCH
GRADUATE FACULTIES, COLUMBIA UNIVERSITY

WHEREVER a river forms a boundary, it presents a problem to the cartographer as well as to anyone trying to ascertain by a glance at the map the nature of the legal rights to the river and its waters and subsoil.

River boundaries are actually of several types.[1] The center of the river (median line or medium filum aquae) is, while often used, but one of several definitions for boundary delimitation. In European practice, it has mainly been used for nonnavigable rivers. The *thalweg*, in Europe and North America, is characteristically a navigation-river boundary. Variously defined, it is based on the trough-line at the bottom of the river and has been described as the "line of the deepest depression of the river bed," the "line of continuously deepest soundings," or the "deepest continuous channel." In the Middle East, however, it has been used increasingly as a boundary definition in rivers that derive their importance not from navigation but from irrigation. Where the river boundary is defined as the *thalweg*, the boundary will be submerged and some water available to each riparian as long as the riverbed is not completely dry.[2] Other cases exist where the bank of the river is used as a base line, and the boundary defined as being at a given distance from the bank—either in the river, or on shore. In still other cases, boundaries are defined as the bank or shoreline itself.

The location of the boundary with respect to the river is important to anyone concerned with navigation rights, irrigation rights, fishing rights, cable-laying and construction rights, and any other questions of utilization of the water or of the riverbed. The exact location of the boundary can of course be ascertained by research into the treaties and other documents delimiting the boundary. On the other hand, it would seem that a good map should give information on boundaries—including, and perhaps especially, river boundaries—with as much care as it differentiates between narrow-gauge and standard-gauge railroads, or between perennial and intermittent streams.

On large-scale maps, river boundaries can be indicated—as is often the practice—by actually locating the boundary in its exact place in or along the river. However, if this is to be meaningful, the map must be of the highest degree of accuracy. Otherwise it is not possible to find the exact location of the boundary by using the map. Furthermore, merely locating the boundary in the stream gives no indication as to changes in the boundary which may occur due to erosion or alluvion. The *thalweg* and the center of the river, like its banks, may slightly change their location, but the several rates of change may be different. Only if the definition of the boundary is known can the location of the boundary be ascertained with reasonable certainty. (International practice, with respect to river boundaries, is usually that the boundary moves with slow, imperceptible movements of the riverbed.)

Where streams are narrow, and on small-scale maps where even comparatively broad rivers are monolinear, the problem remains a serious one for the mapmaker. Drawing the land boundary up to the river, resuming it downstream, and leaving the two boundary-and-river junctions connected only by the line of the stream is an unsatisfactory solution. It hardly clarifies the exact location of the boundary with respect to the river. Placing the boundary symbols on one side of the river—another way of handling

[1] For a discussion of river boundaries, *see* Stephen B. Jones, "Boundary-Making: A Handbook for Statesmen, Treaty Editors and Boundary Commissioners," Chapter 6 (1945).

[2] Middle East practice with respect to river-boundaries is examined in my "River Boundaries in the Middle East: A Study of their Definition in Conventional International Law," *Revue de Droit International pour le Moyen-Orient*, 4th Year, No. 2, pp. 423–435 (December 1955).

this cartographic problem—can be misleading. It may be interpreted as indicating that the boundary is in fact not connected with the river, being simply a land boundary which happens to run near a stream; or it may be read as a boundary located up on the bank, or along the shore line. Without special symbols for river boundaries, the problem of clearly and accurately presenting this sort of data on maps remains unsolved.

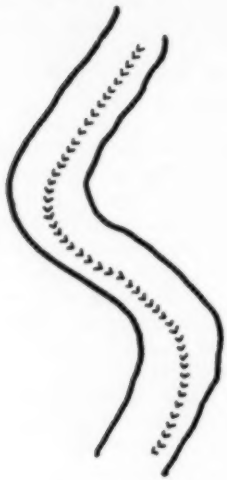
At present, no system of symbols for river boundaries seems to exist. It is therefore hoped that the symbols suggested below will prove acceptable and useful to cartographers who want to provide more exact information on river boundaries, thus enabling any student of legal rights to a river to get a clear picture by a quick look at the map. These symbols were designed with two principal objects in mind: (1) to evoke the boundary definition they represent, at least insofar as possible; (2) not to conflict with symbols now being used.

PROPOSED SYMBOLS

On color maps, these symbols would appear in black

Where the stream is indicated by a double line

Where the stream is indicated by a single line



(a) *Thalweg*

The small "V" symbol represents the cross-section of the stream. The "Vs" should point downstream. Where the scale permits and the exact information is available, the symbols should actually be located in the river's thalweg (left). Grouped in threes, the symbol is placed alternately on each side of the river where the stream appears as a single line. (right).

(b) *Center, median, medium filum aquae.*

The dots placed approximately mid-stream (left) suggest the middle point of the river. The dots are bunched in pairs so as not to conflict with continuous dotted lines sometimes used to indicate navigation lanes. The same symbol (right) is placed alternately on each side of the river where the stream appears as a single line.

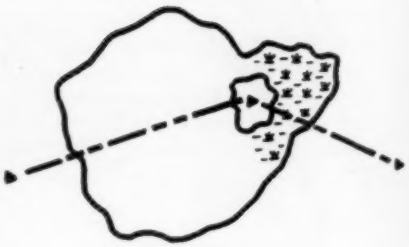
(c) *Boundary at the shoreline.* By straddling the bank which is the boundary (left), the dots emphasize the bank's legal function. (Right) the same symbol as used for monolinear streams.

(d) *In stream, a given distance from shore.* The dash-over-dot symbolizes a line drawn with reference to points on shore. The location of the symbol would depend (left) on the distance from shore as a proportion of the river's width. (Right) the same symbol as used for monolinear streams. The series of dashes are interrupted where convenient to indicate the distance from shore, here ten meters.

(e) *Up on the bank, a given distance from shore.* The symbol here is the same as above, but reversed. Again, the location of the symbol would reflect proportions of distances to scale of map (left), and the distance from shore indicated where convenient. (Right) the same symbol as used for monolinear streams.

The same symbols would of course be used for boundaries defined with reference to a lake, whether or not the lake is traversed by a boundary river. According to this system, the only water boundary situation for which the standard land-boundary symbol should be used is where the water boundary is defined as a straight line connecting points on land, as is sometimes the practice when a boundary crosses a lake or swamp as shown.

Symbol (d) above can also be used for limits of coastal waters, where these limits are defined in terms of a given distance from shore.



Army Engineers Develop Expansible Van

A truck-mounted van which can be expanded to almost twice its seven-foot traveling width has been developed by the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va., to provide the Army with mobile units for photomapping operations.

Mounted on a standard 2½-ton truck chassis, the van can be expanded to 13½ feet by two men in less than five minutes to provide a working area of 230 square feet. If the unit must be moved to a more strategic site, the sides can be retracted in the same amount of time.

Each side wall, built on five outrigger beams which engage sprockets mounted on a longitudinal shaft, is extended by a cranking motion. When the sides are fully extended, hinged floor and roof sections are swung into position. After the end panels are closed, the sides are retracted slightly to give weathertight seals at all joints.

The weight of the van has been kept to a minimum by the use of specially fabricated steel sections, aluminum panels and tread-plate flooring, and aluminum shapes and fittings wherever practical. The walls and ceiling are lined with plywood.

A plastic coating is applied to the roof exterior to reflect sun rays and reduce heat absorption. The entire body is insulated with fiberglass and is fitted with double-glazed, high-altitude, nonfrosting windows equipped with blackout panels.

Fluorescent lighting is provided to obtain maximum illumination and a minimum of radiant heat. The lighting and power receptacle system is equipped with an automatic blackout device to break lighting and receptacle circuits when the doors are opened. All wiring is for 120/208 volt, 3-phase, 4-wire power from an outside source. Generally this power is provided by a trailer-mounted generator which is towed by the truck.

A photomapping company of an Army Topographic Battalion will be furnished with a "train" of eleven expansible vans. Each will be heated and air-conditioned for operation under a wide variety of climatic conditions.

The train will provide facilities for computing, plotting, drafting, editing, and revising; rectifying and printing aerial photographs; mosaic and multiplex compilation; and supply operations.

During World War II, photomapping companies were forced to transport their precision instruments in cargo trucks and work in tents or battered buildings. This resulted in an excessive loss of time from technical operations.

Because of its unique construction features, the expansible van may be suitable for use as mobile maintenance, barber, optical, and map-reproduction shops; dental and X-ray clinics; operating room; and radio, radar, and fire-control centers.

Care of Lenses

By D. L. PARKHURST

CHIEF, INSTRUMENT DIVISION, COAST AND GODETIC SURVEY

THE EASE with which the optical elements of surveying instruments may be damaged or caused to malfunction may not be apparent to those users who are not thoroughly familiar with optics.

A lens system, such as that used in the telescope of a transit, is composed of a number of lenses, each of which has not only been ground to the proper shape, as determined by mathematical computations based upon the known properties of the glass itself, but must be accurately positioned with respect to the other elements and must also have its optical axis coincide with that of the other lenses.

It is also essential that the lenses be clean in order to properly transmit the desired image. Surveying instruments are frequently used under severe conditions and may receive shocks that will disturb lens alignment, and dust and dirt may not only get on exterior surfaces but inside the lens system itself.

Obviously the instrument cannot be returned to the factory every time it gets a jolt or gets dirty, so a few suggestions relative to care of lenses may be helpful.

It should be remembered that optical glass is not particularly hard and may easily be scratched. Dust should be carefully brushed away with a *clean* camel's-hair brush, and it is preferable to hold the lens downward when brushing so that any loosened dirt will fall away.

Finger prints on lens surfaces should be avoided for several reasons—principally because the greasiness of the print will tend to retain dust and dirt.

Special lens-cleaning tissue is available and this clean, soft material should be lightly wadded and gently passed over the surface when cleaning. *Do not rub.*

Lens-cleaning fluid, obtainable at any camera shop or optician's, should be used with lens tissue for removal of more persistent scum. Wipe gently, using a circular motion. Breathing on the lens will usually provide enough moisture for ordinary cleaning. *Do not* use acid, alcohol, or other solvents. Never use anything of an abrasive nature.

Sometimes a lens will work loose in its cell. In the case of an objective (front) lens, the cell may usually be screwed back out of the telescope and the holding ring tightened without the use of tools.

Such a lens is usually formed of two elements, cemented together. Where an objective is of the type which consists of two or more elements which are not cemented together but are held in place by separators, with air between the elements, it is better for the nonexpert user to leave such a lens alone and have it corrected professionally.

Where dust and dirt have worked their way into the main body of the telescope, it is better to have the instrument cleaned at the factory or by a trained repairman.

Eyepiece lenses, if easily removable, may be cleaned in the same manner as an objective. Eyepieces are, however, usually held in place by a tiny screw, or screws, which should only be removed, using a jeweler's screwdriver, under circumstances where such a tiny screw cannot be lost if dropped. If the telescope has been jarred or damaged so that misalignment of the lenses is known or suspected, it should be returned to the maker for checking and repair.

Control Surveys and Photogrammetric Maps for Superhighways

By WILLIAM R. COOK

J. E. GREINER COMPANY, BALTIMORE, MARYLAND

EDITOR'S NOTE.—The recently enacted Public Law 627; Title I—Federal-Aid Highway Act of 1956, contains two sections which are closely related to the methods described by Mr. Cook and are of interest to members of ACSM.

SEC. 119.
DEFINITION OF CONSTRUCTION

The definition of the term "construction" in Section 1 of the Federal-Aid Highway Act of 1944 is hereby amended by inserting after "mapping" the following: "(including the establishment of temporary and permanent geodetic markers in accordance with specifications of the Coast and Geodetic Survey in the Department of Commerce)".

SEC. 121. MAPPING

In carrying out the provisions of this title the Secretary of Commerce may, wherever practicable, authorize the use of photogrammetric methods in mapping, and the utilization of commercial enterprise for such services.

TO ESTABLISH a similarity in the use of control surveys and photogrammetric maps for superhighways and toll roads or turnpikes, it is intended to present the case history of a major turnpike project as a working example. This case history will trace progress from conception as a feasible project, through the various phases of development, to dedication. In this manner, the writer hopes to demonstrate similarities which exist, and thereby exploit the benefits which actual experience alone provides.

The words "toll road" or "turnpike" both connote financing by the sale of revenue bonds, liquidated solely by the revenue earnings of the facility itself. The word "superhighway" implies a type of facility envisaged in the Federal Administration's proposed 10-year highway building program. It is believed useful to maintain this distinction for the purpose of later emphasis.

FACTORS IN COMMON

When reduced to the least common denominator, both types of projects have the following factors in common:

Time—Statistics compiled by various agencies support government estimates that right now, in 1956, there are around 61,000,000 motor vehicles operating on the nation's 3.4 million miles of roads. By 1965 it is expected this number will increase to 81,000,000 vehicles. It is further estimated that total travel on our nation's highways will be up 39% in ten years. With that prospect in store for the future, the element of time becomes common to both. The method of financing an expanded network of superhighways and turnpikes, whether it be by private capital as revenue-bond projects, or by federal funds derived from taxation, is immaterial for the purpose of this discussion. Time alone is of the essence.

Manpower—Requirements for engineering personnel to plan, design, and supervise the construction of either type of project are substantially the same. The construction contractors' manpower requirements from the administrative level to the common laborer are identical.

Pressure—Pressure for progress which is brought to bear on administrative, engineering, and construction forces, is another factor common to both. On a toll-road project, once the bonds are sold, there immediately develops a race against time to complete final designs and construction of the project, so that it may, in the shortest time possible, become a revenue-earning facility. On a government financed

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superhighway project, pressure for progress exists at the outset, since the project is an offspring of necessity. The relief the completed facility will provide in the public interest simply amplifies public and political pressure.

Stages—The fundamental stages of development are essentially the same. For both, there must be preliminary planning—either a feasibility or engineering report. The stages of preparation of detailed designs and specifications, construction, and finally, maintenance and operation are likewise comparable.

These are but a few of the factors common to both superhighways and toll roads. However, it is not the purpose of this paper to dwell on these matters, but rather, to explore more explicitly the application of control surveys and photogrammetric maps to both.

Having worked on Ohio Turnpike Project No. 1 through all stages of its development, it is possible for the writer to describe the actual application of control surveys and photogrammetry to this major revenue-bond type project, as a case in point.

STAGES OF DEVELOPMENT

Following preliminary engineering studies, which, combined with traffic and anticipated revenue reports, established the project as being financially feasible, the preparation of an engineering report was begun. An agreement to prepare this report, between the J. E. Greiner Company, Consulting Engineers, Baltimore, Maryland, and the Department of Highways of the State of Ohio was consummated June 14, 1950. Under the terms of this agreement, submission of the completed report to the Director of Highways was scheduled for August, 1951. The first of a series of deadline dates was thus established.

The element of time at this stage assumes significant proportions only if one is cognizant of the scope, detail, and ultimate purpose of such a report. Without enumerating the many facets of an engineering report, it is presumed sufficient to summarize its purpose by saying, in the final analysis, it is the document upon which the fiscal experts and bankers base their decision to risk the funds necessary to construct the facility.

The consulting engineer awarded a contract for the furnishing of strip topography along the 241 mile turnpike route to Air Survey Corporation, Arlington, Virginia, in mid-June, 1950. Under this contract, penciled vellum tracings were furnished at a scale of 1 inch equals 200 feet of a strip 2000 feet wide, by 241 miles long, with contours at 5-foot intervals, including all topographic detail visible on the photography. Complete delivery of these manuscript tracings was specified to be made within 10 weeks after notice to proceed was given the contractor.

Prior to award of this contract, investigation of existing horizontal and vertical control in the vicinity of the proposed aerial survey was undertaken. This investigation revealed that a sparse network of very early triangulation was established and later expanded by transit traverse in lines conforming generally to the edges of the 15-minute quads. Before 1904–1908, additional control from the transit traverse was extended into the interior of each quad sheet by means of buggy traverse. In 1904, the Beaman Arc and stadia method of expansion was introduced, and by 1908, was fully employed. Control expansion was then done with an accuracy of 1 in 1000. Precise level circuits had been run, and third-order levels expanded therefrom, with fly-level circuits off the third-order work along most roads. Because of the inadequacy of horizontal control in the interior of the quadrangles, the use of existing A.A.A. photography, which requires horizontal control for each stereo model, was deemed inadvisable. As a consequence, it was agreed that new special-purpose photography would be flown for use in the Multiplex System, whereby the transit-traverse third-order control could be extended into the interior of the quadrangles, thus eliminating the necessity for relying on buggy-traverse control. It was further agreed, that in order to complete the job within the allotted time, it would not be feasible to do any ground work, except field

identification of established control in certain instances.

The State system of plane coordinates in Ohio is based on the Lambert Conformal Projection, divided into two zones (North and South). Parallels of latitude of the North Zone, within which the entire project falls, are 40° 26′ and 41° 42′, and the central meridian at longitude 82° 30′.

State grid lines for 1000-foot squares were shown on the manuscript tracings furnished by the mapping contractor, and all elevations were based on mean sea level datum (C&GS).

Following delivery of these tracings within the allotted time, the consulting engineer proceeded with development of a paper location of the turnpike centerline.

The basic route of the turnpike, confined within the limits of a band one mile wide, had previously been determined in connection with the preparation of the feasibility report. This route, starting at the western terminus of the Pennsylvania Turnpike, extends in a northwesterly direction, passing southwest of the Youngstown-Niles-Warren area and north of the Ravenna Arsenal. From the east end of the Arsenal, the route extends westerly to a point north of Akron, thence northwesterly through the southern fringes of metropolitan Cleveland, to a point between the cities of Elyria and Lorain. From the Elyria-Lorain area to Toledo, the route approximately parallels U. S. Route 20 to the north, and crosses the Maumee River south of the city of Toledo. The route then continues in a westerly direction through the northernmost tier of counties to the Ohio-Indiana State line at a point approximately 5½ miles south of the southern boundary of Michigan.

Working on ozalid prints taken from the original manuscript tracings, a paper location of the turnpike centerline was developed. The location of this preliminary line was based upon geologic and soil conditions, right-of-way costs, structure sites, and interchange locations. As refinement of the preliminary alignment progressed, greater emphasis was given to meeting the standards for horizontal alignment and profile grade set forth in the design criteria for the project. Problems created by natural conditions, such as lakes, rivers, and deep-peat swamps, as well as land use in general, were resolved by extensive studies of the aerial photographs supplemented by field reconnaissance. After a preliminary alignment for the entire route had been determined, many critical areas were reexamined, and further adjustments were made to satisfy economic or other considerations.

Coordinates of the points of intersection (P.I.s) of the centerline tangents were scaled and used to compute the bearing and distance of each tangent, for the purpose of determining stationing along the turnpike centerline.

The horizontal and vertical alignment of the turnpike, together with other features of design controlling the general development, were presented in the form of strip maps. Horizontal alignment was traced directly from the working prints of the photogrammetric maps, and approximately 6000 feet of roadway was shown on each tracing.

In the course of developing the engineering services specifications, it became necessary to reappraise the entire matter of horizontal control, in order to formulate a plan of approach to the problem of reproducing the turnpike centerline on the ground as it appeared on the strip maps. It should be recalled that the consulting engineer, to conserve time, had elected to accept from the mapping contractor photogrammetric maps which were based entirely upon existing control. The order and spacing of this existing control eliminated from consideration the possibility of computing coordinate ties from traverse stations to selected points on the turnpike centerline as a method of establishing the turnpike centerline on the ground. Horizontal accuracy of the photogrammetric maps was designed for 1:10,000 in the specifications issued to the mapping contractor. With these facts in mind, it was decided to scale ties between various physical features shown on the photogrammetrics and the plotted turnpike centerline as a means of controlling the stakeout. Considerable care was exercised in choosing these selected ties; that is to say, road inter-

sections were used whenever possible, fence lines were projected to road or railroad centerlines to provide a point from which to measure, right-angle fence-line intersections were used, as were the corners of certain buildings, which, by inspection were determined not to be symbolized outlines. To insure the maximum accuracy, this scaling of selected ties was done directly from the manuscript tracings upon which the final centerline paper location had been plotted, using the coordinate values of the P.I.s scaled on the working prints. It was known at this point, that the 241 miles of turnpike would be divided into 21 design sections. Four of these would be limited to major structures spanning the principal rivers, and the remaining 17 would be roadway sections. It was further known that contracts would be awarded to numerous engineering firms to develop detailed designs, prepare contract drawings, and supervise construction within specific design sections. Right-of-way negotiation and acquisition, based on alignment shown on the strip maps, was scheduled to commence immediately after the sale of bonds. This necessitated reproducing a project survey centerline on the ground which would coincide with the plotted paper location within a tolerance of 10 feet laterally.

The limits of each design section were referred to centerline stationing. One selected point on a survey centerline tangent near the beginning of each design section was designated as a "Point of Origin" for alignment surveys in that particular section. The maximum number of ties to this selected point were scaled from physical features shown on the map, as were the coordinates of the point. The engineering specification required that a Polaris observation be taken at this "Point-of-Origin." Plane coordinate projection tables would be used to ascertain the value of the angle correction to be applied to the astronomical bearing determined by the observation. The engineer could then establish in the field a grid bearing for the initial tangent which would coincide with the computed grid bearing shown on the strip map. Subsequent tangents of the survey centerline could then be staked, using the computed grid bearings and distances shown on the strip maps as basic control, provided that lateral tolerance of 10 feet was not exceeded at selected control ties along the way.

All of the preceding events occurred prior to the actual sale of bonds. Following a favorable State Supreme Court decision on a mandamus action to test the legality of the legislation creating the Turnpike Authority, sale of bonds was quickly consummated in July, 1952. Contracts were promptly awarded to 17 engineering firms for completion of the detailed designs, preparation of contract drawings, and other related contract documents, as well as immediate supervision of construction of the turnpike within the limits of their assigned design sections. These activities were to be directed and coordinated by the consulting engineer, whose contract provided for responsible charge of the project, in the interest of both the Turnpike Commission and the bond holders.

Surveys were started simultaneously in practically all of the design sections. The engineering specifications required 1:10,000 accuracy for the alignment stakeout, and prohibited the introduction of any curves other than those identified on the strip maps. Vertical control, based on mean-sea-level datum (C&GS) was specified, to be governed by the requirements of second-order accuracy.

As the stakeout of the turnpike survey centerline progressed, some requests for supplemental tie points were made by the engineers, in order to reconcile apparent errors in the selected ties shown on the strip maps. The fact that the engineers were required to establish the centerline on the ground, within the limits of 10-foot maximum lateral tolerance at these selected tie points, in many cases fostered the need for supplemental ties to resolve a difference of but a few feet. The right-of-way acquisition program was also now in progress, concurrent with the stakeout, and since this problem involved details such as title searches, assignment of parcel numbers, field appraisal, and negotiation—to mention but a few—it was mandatory that the specified toler-

ance limits be maintained. The right-of-way agents were using prints of the same-strip maps that had been furnished to the engineers for stakeout purposes.

Ties had been selected primarily to control the direction of the tangents. However, since longitudinal shifting of a P.I. would have resulted in lateral displacement of the centerline location of the curve connecting the tangents, the positioning of the P.I.s assumed significant importance. Basic design criteria requirements had limited the degree of curvature for each curve. As a consequence, the engineer was obligated to use the degree of curvature listed on the strip maps. It should be realized that, since the plan and profile sheets made available to the engineers for staking the turnpike centerline had been traced directly from the photogrammetric maps, they provided a continuous picture control and thus permitted immediate recognition of direction divergences.

Although numerous stakeout problems materialized as a result of localized map deficiencies or survey methods, only two situations of a critical nature developed that could be traced directly to inaccuracy of the photogrammetric maps. In each case, near-maximum length of tangent was involved. After a detailed study was made of each situation, it was concluded that adjustments made in bridging between controls had created a minute divergence in the direction of the plotted lateral grids at these locations. The direction of these two tangents was rotated by means of a graphic solution, to satisfy the tolerance requirements at the maximum number of tie points and to provide for an acceptable positioning of the P.I.s.

The engineer for each design section was required by the specifications to coordinate his survey activities with those of adjoining engineers, and to reconcile any differences in the alignment of tangents common to both sections. The centerline was then stationed. Field ties were made to intercepted section lines, roads, railroads, and fences. Centerline Survey Maps were then prepared and filed for recording in the local county courthouses. Curve data, bearings, stationing, township name, and land-survey section numbers were shown on these maps. Each map also bore the seal and signature of a registered surveyor (State of Ohio), and the signature of the Director of Highways. The centerline survey maps were drawn to the same scale (1:1,200) and on the same size sheets planned for the construction contract drawings. When recorded among the land records, they served as reference documents for the description of right-of-way parcels being acquired for construction of the turnpike.

The turnpike centerline was now staked on the ground within the specified tolerance limits at the location delineated on the strip maps. Since basic control of sufficient accuracy and density existed only in widely separated areas, and generally, with few exceptions, was too far removed from the turnpike centerline to justify running traverse ties, selected points on the survey centerline were not coordinated at this time.

Using the data supplied on the centerline survey maps, a coordinate recomputation of the turnpike alignment was made. This recomputation provided only a rough check, but did, however, establish the absence of any large errors in field measurement.

Customary precautions were taken to preserve the staked alignment during the interim between design and construction.

During the construction phase of the project, only routine survey problems developed. As construction reached the final stage, permanent concrete monuments were set at selected points along the survey centerline of the turnpike. Bronze markers set in the top of these monuments have the elevation of the marker, county name, and a reference number stamped on them. Each monument is referenced and catalogued for use on subsequent surveys. Control points of all horizontal curves are so marked, as are a sufficient number of points on the various tangents to provide intervisibility between them.

The foregoing events illustrate the role that control surveys and photogrammetric maps played in the development of the case in point—Ohio Turnpike Project No. 1. Be-

ginning in June, 1950, this project was formally opened to traffic, October 1, 1955.

Numerous refinements in technique and application of control surveys and photogrammetric maps were developed by the consulting engineer as a direct result of these experiences on the Ohio Turnpike. Many of these refinements were incorporated into the development of subsequent projects. Some of these projects are presently under construction: e.g., Indiana (East-West) Toll Road and several Pennsylvania Turnpike Extensions. Others in the Engineering Report stage include: The Michigan Turnpike, Indiana (North-South) Toll Road, a turnpike in Washington State, and Ohio Turnpike Project No. 2.

SUMMARY

Although the foregoing case history of a major turnpike describes numerous developments with regard to the application of control surveys and photogrammetric maps that were peculiar to this particular project only, the over-all sequence of development for either turnpikes or superhighways is essentially the same. Preliminary planning, engineering studies and report, design, construction and maintenance are stages of development required for both.

Availability and density of fundamental horizontal and vertical control will govern, to a great extent, the choice of methods to be used. Of prime importance, however, is the degree of accuracy of control made available during the preliminary and engineering-report stages. These control surveys, both horizontal and vertical, should be of the ultimate required accuracy. Most of us, at one time or another, have been faced with the problem of utilizing basic survey data for final planning that had been provided initially in degree sufficient for preliminary planning only. Time (and money) apparently saved by shortcuts in establishing the reference framework may be lost several times over during the design and construction phases. The element of chance that this situation presents, particularly with regard to the type of highway work being discussed, may well be overcome by initially selecting an order of control that will satisfy the requirements for both stages. Decisions in this matter must be made realistically however, since accuracy requirements for control will naturally vary considerably between urban and rural areas.

CONCLUSIONS

It is believed that a Master Plan, as such, for the ultimate development of the Administration's planned roadway improvement program does not yet exist. However, in preliminary route planning, consideration will undoubtedly be given to the following:

1. Natural travel routes
2. Centers of traffic generation as indicated by population, industry, and motor-vehicle registration
3. Traffic congestion
4. Economic features of the region
5. Condition and suitability of existing connecting routes
6. Traffic desire lines—not only for long distance travel, but also for local movements

Considering the magnitude of such a program undertaken simultaneously on a nationwide scale, it seems reasonable to presume that Federal survey and mapping agencies could not, within the limits of time that completion of the program would impose, expand their own personnel and facilities to furnish all of the necessary control surveys. The services of qualified private engineering organizations may well be required to augment the capacity of Federal agencies. An analogous situation is the currently increasing use of the services of consulting engineers by many State Highway Departments.

It should be constantly borne in mind that aerial photogrammetry has in recent years acquired unprecedented accuracy and engineering acceptance. Its widest possible use is a prerequisite of economy in personnel. Availability of engineering talent in the final analysis, will dictate the degree of success the proposed road building program will achieve. Provided with adequate control, the cost-saving advantages of aerial survey and mapping methods can also be exploited for subsequent development of industry, util-

ities, real estate, etc., adjacent to the constructed turnpikes and superhighways.

ACKNOWLEDGMENTS

The writer gratefully acknowledges his thanks to J. J. Jenkins, Jr., Partner, J. E. Greiner Company; several colleague engineers of Greiner Company; and B. E. Beavin, Sr., of Benjamin E. Beavin Company, for their contributions to the material presented in this paper.

Special thanks are directed to Carl W. A. Supp, Senior Soils and Geological Engineer of J. E. Greiner Company, for the timely advice and able assistance he gave during all stages of preparation of the paper.

International Cooperation on Cartography

The following resolution—United Nations Economic and Social Council, 21st Session, Item 6, International Cooperation on Cartography, May 2, 1956 (Approved unanimously)—is published for the information of the membership of the American Congress on Surveying and Mapping.

—EDITOR

The Economic and Social Council

Having before it the report of the Secretary-General contained in documents E/2823 and Add. 1 and the report of the United Nations Regional Cartographic Conference for Asia and the Far East (E/CONF.18/6),

Recognizing the importance of accurate and relaible cartographic information, more especially in connection with economic development projects,

Noting the results of the Secretary-General's consultations with Governments and appropriate inter-governmental organizations on the adoption of a standard method of writing geographical names on maps and on means for completion of the one-millionth map of the world,

1. *Commends* the Conference for the work achieved,

2. *Draws the attention* of Member Governments to the possibilities of requesting technical assistance in the field of cartography under the Expanded Program of Technical Assistance,

3. *Recommends* that those regional economic commissions which think it desirable consider the question of establishing cartographic committees for the purpose of periodic consultation on cartographic matters among their members,

4. *Requests* the Secretary-General

(a) in co-operation with interested international organizations and such experts as he may wish to consult within the limits of budgetary availability, to draft the general framework of a programme looking toward maximum international uniformity in the writing of geographical names and to submit it to Governments of Member States of the United Nations and/or of the specialized agencies for their comments, and to report to the Council at a subsequent session, and

(b) to prepare, on the basis of proposals already received a draft text of amendments to the existing International Map of the World specifications designed to allow the maximum possible flexibilitiy, bearing in mind the need to maintain both the ICAO World Aeronautical Chart series and the International Map of the World on the millionth scale series, and to submit its draft text to Governments of Member States concerned for comments and to report to the Council at a subsequent session.

5. *Invites* Member Governments to comment on the proposals and recommendations of the Secretary-General mentioned in sub-paragraphs 4 (a) and 4 (b) of this resolution,

6. *Further requests* the Secretary-General to take the necessary steps to convene in 1958 in Tokyo, Japan, a second Regional Cartographic Conference for Asia and the Far East, including the preparation of a provisional agenda and the sending of invitations to Governments of States Members of the United Nations and/or of the specialized agencies, and to the specialized agencies and other inter-governmental organizations.

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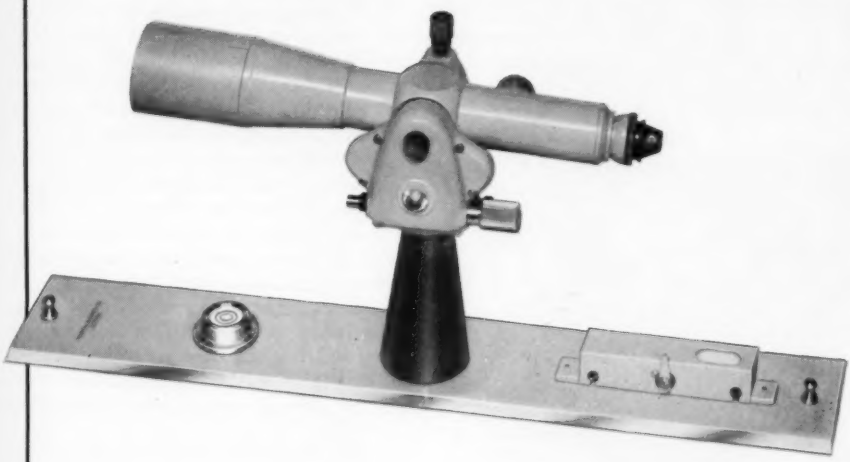

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Pendulous Cantilever Principles Applied to Self-Leveling Instrument Design

By ROLLAND L. HARDY

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IT IS THE PURPOSE of this paper to present the highlights of a spare-time investigation of self-leveling instrument design conducted by the writer during the period 1951–1955. Acknowledgment is made that the material of this paper has been largely extracted and summarized from a professional graduate thesis recently accepted by the Department of Civil Engineering, University of Missouri School of Mines and Metallurgy.

FIGURE 1.—Willis pendulum astrolabe.

It is quite evident that both manufacturer and user interest in modern self-leveling instrument design is accelerating at a rapid rate. See figures 1, 2, 3, and 4, which show the Willis Pendulum Astrolabe, Zeiss-Opton Automatic Level, Geological Survey Pilot Model Pendulum Alidade, and Filotecnica Salmoiraghi Automatic Level, respectively. Of these four instruments, two are European (Zeiss-Opton and Filotecnica Salmoiraghi automatic levels). Both European instruments, and one of the American instruments (Willis Pendulum Astrolabe) use flexural pivots in their construction. A flexural pivot is a resilient structural member or members with selected degrees of freedom appropriate for the mechanical use to which it is applied. The author believes that this paper presents a new method of flexural-pivot design.

A self-leveling level seemed to be a very practical goal and a considerable amount of time was spent on this problem. Having no formal engineering training at that time, however, the results turned out to be highly impracticable. Being of insignificant value in the development of self-leveling instruments, the results will not be discussed further. However, the author's interest in self-

FIGURE 2.—Zeiss-Opton automatic level.

Presented at the Sixteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 19–21, 1956.

leveling instruments was naturally rekindled with vigor in 1951, after the acceptance of his suggestion for a Pendulum Alidade by the Geological Survey and after the appearance of the Zeiss-Opton Automatic Level.

Use of flexural pivots in the Zeiss-Opton Level suggested the possibility of using flexural pivots as a means of self-leveling a vertical arc or circle. This could be an alternate means of supporting the arc in the pendulum alidade. Although the first models of the alidade were already under construction by the Geological Survey with ball bearings as the support for the pendulum, it was realized that ball bearings were not necessarily the desirable final solution. Concurrently with the preliminary investigation of flexural pivots the author investigated the use of master and slave pendulums as a means of improving ball-bearing efficiency in self-leveling instruments. Although the latter is feasible, to a certain degree at least, there are many advantages apparent in the use of properly designed flexural pivots and detailed consideration of the use of ball bearings in self-leveling instruments is not a part of this presentation.

A preliminary investigation of flexural-pivot systems utilized in the Willis Pendulum Astrolabe and Zeiss-Opton Automatic Level was made by the author in 1952 to determine whether or not they were directly applicable to supporting a vertical arc or circle in such vertical-angle measuring instruments as alidades, transits, and theodolites. It was found that they were not, principally for the reason that the pivot systems used

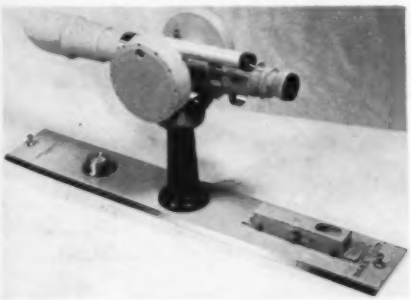


FIGURE 3.—U. S. Geological Survey pilot model pendulum alidade.

FIGURE 4.—Filotecnica Salmoiraghi automatic level.

therein are not complete pivots in the sense that they were analytically designed to rotate a pendulum-actuated component around a specific and stabilized center of rotation in a known or especially desirable space position. (This is obviously a strict requirement for a vertical circle or vertical-circle fiducial systems for reasons of preventing eccentricity.) It was further found that the development of unusual optical techniques, which apparently permitted the empirical design of the flexural pivot systems in each instrument, had actually resulted in a lack of published information concerning the behavior of flexural pivots in surveying instruments from the standpoint of theoretical engineering mechanics. As a result of the preliminary investigation and subsequent discoveries made during progress of the work it was decided to design and develop both techniques and experi-

mental models in the field of self-leveling instruments by using engineering mechanics, particularly cantilever beam theory.

Development of Equations for the Altitude Control Problem

For reasons of simplicity a decision was made that the theoretical analysis should apply to a vertical cantilever system with a concentrated load at its free end. Initially the problem was related only to automatically performing the functions of the altitude-control bubble and corresponding control knob on such optical-reading instruments as planetable alidades and theodolites. Later it was found that the technique developed herein was applicable to automatic levels also. For the initial cases it was assumed that the fixed end of the vertical cantilever system would be attached directly or indirectly to an instrument standard. The pendulum-loaded free end of the system would be designed to properly reference a vertical circle or vertical-circle fiducial system to the direction of gravity. Consequently the problem was defined as a requirement for equations which express the simultaneous accomplishment of these objectives:

(a) Indicating the direction of gravity within the operating plane (vertical circle), even though the fixed end of the pivot is tilted at a small vertical angle relative to a true vertical axis.

(b) Effectively rotating both the free and fixed ends of the pivot around the center of the vertical circle (or center of the fiducial system).

Figure 5 represents a nearly vertical cantilever subjected to a load P. which is concentrated at the free end of the beam. (The weight of the beam itself is considered to be negligible or zero.) The axis of the fixed end of the beam, which is also the nearly vertical axis of the standard in a plane parallel to the vertical circle, is tilted at a small angle α relative to the true vertical axis V–V. The length of the beam is annotated as L, with that portion of the beam located below the center of rotation being designated as L_1. Maximum beam deflection is denoted as Δ. Coordinate axes, with

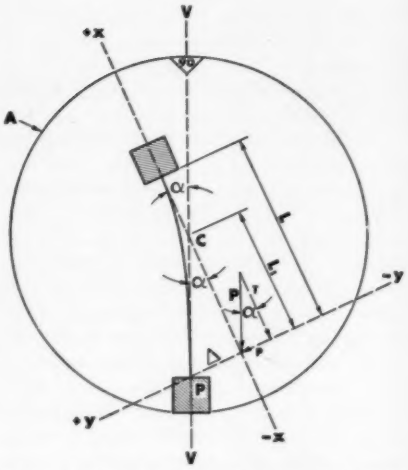


FIGURE 5.—Pendulous cantilever applied to altitude conrtol problem.

signs as shown, have been selected so that the x axis coincides with the axis of the undeflected beam. The y axis passes through the undeflected position of the concentrated load. To denote the vertical-circle relationship, the circle A is attached rigidly to the lower end of the cantilever and effectively centered at C. Attached to the upper central portion of the circle is a fixed pointer, arbitrarily numbered 90, which indicates the required stability of the system in referencing zenith of the circle to the direction of gravity through the center of rotation.

Two conditions are imposed on the derivation at the outset. These are:

$$(1)\ \tan \alpha = \frac{\Delta}{L_1};\ \text{or when } x=0,\ y=L_1 \tan \alpha$$

$$(2)\ \frac{dy}{dx} = -\tan \alpha\ (\text{when } x=0)$$

Neglecting the weight of the beam, it is evident that the p and t components of the total load P acting upon the beam are as follows:

$$(3)\ t = P \cos \alpha$$
$$(4)\ p = P \sin \alpha$$

It can be shown that a moment expressed as $t\ (\Delta - y)$ opposes the moment px, and that it is a linear reduction of px in the proportion that the final deflection is less than the deflection computed for px alone. Accordingly, y can be expressed as $c\ (L - x)$ in which c for any small angle α is Δ/L. The total exterior moment then becomes:

$$(5)\quad M = (p - ct)x$$

Expressions for slope and deflection can then be obtained in the usual manner by substitution in the general elastic-curve equation and double integrating to produce:

$$(6)\quad EI\frac{dy}{dx} = \frac{(p - ct)x^2}{2} - \frac{(p - ct)L^2}{2}$$

$$(7)\quad EIy = \frac{(p - ct)x^3}{6} - \frac{(p - ct)L^2x}{2} + \frac{(p - ct)L^3}{3}$$

Substitution of the slope condition from (2), the trigonometric expression for p and t from (3) and (4), and $L_1 \tan \alpha \div L$ for the constant c, into the slope equation (6) when $x = 0$, then produces:

$$(8)\quad L^2 = \frac{2EI}{P \cos \alpha} + L\,L_1$$

Similar substitution of the deflection condition from (1), the expressions for p and t, and $L_1 \tan \alpha \div L$ for the constant c, into the deflection equation (7) when $x = 0$, likewise produces:

$$(9)\quad L_1 = \frac{P \cos \alpha\, L^3}{3EI} - \frac{P \cos \alpha\, L_1\, L^2}{3EI}$$

Solved simultaneously, and selecting α small enough that $\cos \alpha$ can be eliminated from consideration, equations (8) and (9) respectively reduce to:

$$(10)\quad L = \sqrt{\frac{6EI}{P}}$$

$$(11)\quad L_1 = \tfrac{2}{3}\,L$$

Discussion of Derivation

Equations (10) and (11), as derived, provide considerable insight into the flexural properties of the vertical cantilever. It can be seen that with α being small, as can easily be accomplished by approximately leveling the instrument, a design incorporating the factors necessary for establishing both the direction of gravity and a stable center of rotation can be obtained that is largely independent of small angles of instrumental tilt. If the actual length of the vertical cantilever is greater than the minimum required, these equations indicate that the excess quantity is not part of the elastic curve but a vertical tangent. Consequently, the center of rotation will remain at the same distance from the fixed end despite any increase in length beyond the minimum required length provided there is no change in material, cross section, or weight.

In the absence of exact design values, it is evident that the actual length of the flexural pivot should be designed to safely exceed the minimum required curve length to insure the direction of gravity as a reference. Reasonably proportioned in advance, the pivot will lend itself admirably to empirical location and adjustment of the center of rotation. Figure 5 does not purport to represent the conditions that may occur or become necessary in actual practice. It is exaggerated for reasons of illustration, representing an ideal situation in which the center of gravity coincides with the free end of the beam and the actual length and minimum required length are equal.

For the illustrated conditions, equation (10) indicates that a thin metal strip 0.002″ × 0.150″ in cross section and with $E = 1.7 \times 10^6$, for example, could reference the direction of gravity with a length of 0.286″ when supporting a 2-ounce load. The maximum static stress on such a pivot can be determined by the usual method for combined axial and bending loads $S = \frac{P}{A} + \frac{Mc}{I}$. Consequently, if the maximum value of α to be permitted in approximate leveling of an instrument is 30 minutes of arc, it can be shown that the maximum static stress on the member cited as an example would be about 1460 pounds per square inch. Structurally speaking, this is a very low value and it means that a large margin of safety can be made to exist with relation to the severe impact stresses that may be caused by careless handling of surveying instruments.

There may be some interest in the calculation of vertical motion of the pivot point during bending, which is due to the fact that the length of the elastic curve is not equal to the sum of the intersecting tangents drawn from the ends of the curve. Fortunately the elastic curve under consideration herein is a cubic parabola. Highway easement curves have the same basic characteristics. Reference to any set of tables showing factors for the length of spiral curve, with corresponding lengths of the short and long tangent, indicate immediately that the discrepancy is negligible for a central spiral angle as small as 30 minutes of arc and a length of spiral as short as a fraction of an inch. The magnitude of pivot point motion can be calculated from such tables, however, if it is considered necessary. For the example cited above, the discrepancy between length of curve and sum of tangents is less than 0.000003 inch at a maximum deflection of 30 minutes of arc.

Discovery of a Simple Optical Principle

During and immediately after the development of the design equations for the problem previously discussed, a study of the unique optical principles used in the Willis Pendulum Astrolabe and Zeiss-Opton Automatic Level was undertaken. During this study a novel but simple optical principle was discovered which enables a properly designed flexural pivot to be used with conventional optical systems. Thus, the investigation moved into a second phase concerning automatic levels and astrolabes, whereas the previous theory developed by the author concerns alidades and theodolites. Figure 6 shows a vertical telescope with a mirror below the objective which reflects an exterior horizontal line of sight into the telescope along its axis of collimation. Comparison of figure 6a with figure 6b shows that the mirror should be rotated about the same axis and in the same relative direction as the telescope. The relative magnitude of mirror rotation, however, must always be one-half the rotation of the telescope for automatic leveling to be continuously accomplished. It is self-evident that image stabilization at any desired fixed angle can be accomplished by relative shifting of the initial positions of the telescope and mirror. Thus, the principle is also applicable to astrolabes as well as levels. For reasons of simplicity in illustrating the principle and its application to an automatic level, a vertical telescope has been shown in figure 6; with two mirrors in front of the objective, one fixed and one rotating, a horizontal tele-

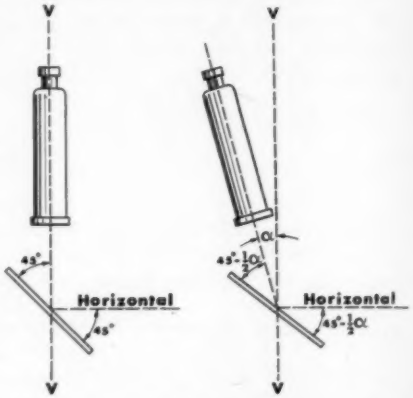


FIGURE 6.—Automatic leveling effect obtained by a simple optical principle.

scope could have been shown. Having presented the basic features of this optical effect, it is again possible to undertake a resistance of materials approach in providing a flexural pivot solution to this problem. However, the theoretical technique of designing a pivot to replace the altitude-control bubble and knob on such instruments as alidades and theodolites has been previously presented and it is not considered necessary to present a similar derivation for the automatic level or automatic-leveling attachment problem. Suffice it to say that theoretical engineering mechanics can and have been used by the author to design the required pivot systems.

Summary of Theoretical Approaches

At this point a summary of the suggested use of theoretical cantilever principles for new surveying instruments or attachments is

in order. Two specific problems and their theoretical solutions, involving centers of rotation of vertical cantilever beams and the flexural relationships that provide slopes to the free end which are either equal to the angle or one-half the angle through which the fixed end rotates, have been briefly presented as applicable to flexural pivots for use in surveying instruments. Empirical adjustment of deviations from ideal conditions caused by existing approximations in the design equations, lack of accuracy in preliminary design data, or subsequent assembly techniques have been suggested as a practical means of providing precise operational characteristics. The unique theoretical technique of this presentation has been in the aspect of departing from the classical consideration of the cantilever beam as a vertically loaded horizontal member having a non-rotating fixed end so that the bending component of the load is practically constant throughout the range of consideration. Flexural compensation, resulting from the fact that the bending component of a vertical load on the free end of a vertical cantilever is equal to or varies proportionately with the torque produced by small angles of rotation at the fixed end, is the essence of a new approach.

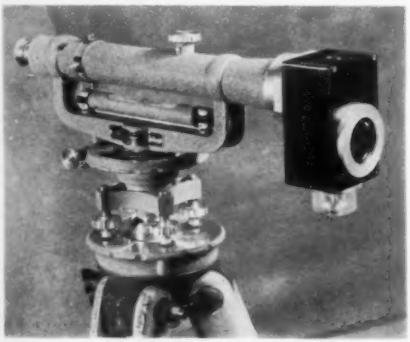


FIGURE 7.—Experimental model of automatic leveling attachment.

Design and Development of Experimental Instruments

During and after the theoretical study of pendulum-actuated devices for improved surveying instruments, several experimental models were designed by the author.

The most recent of these consisted of a pendulum-actuated automatic leveling attachment for conventional-type levels (*see* figure 7). Preliminary tests performed immediately after delivery verified the flexural theory on which the design was based. This was also indirect proof that the previously established static theory concerning flexural pivots for vertical arcs and circles was substantially correct. Nevertheless, vibration damping was a serious problem for a time. Later, however, empirical improvements in damping were made to the extent that a practical field test of the attachment was possible without making a major modification in the original design.

Field Test of Experimental Level Attachment

The automatic leveling attachment as shown in figure 7 was attached to the objective end of an ordinary builder's type dumpy level for the purpose of a field test. Prior to that test, the combined level and leveling attachment were subjected to the usual peg adjustment.

The test consisted of a closed loop of leveling slightly more than two miles in total length. The instrument was approximately leveled at each setup to an estimated accuracy of ±10′ arc. A Philadelphia-type leveling rod, without target or rod level, was used by the rodman. Fore and backsights were approximately balanced by pacing. Approximately two hours' time were required for the complete test operation. A second-order closure (0.05 foot) was obtained in the first field test. This may not significantly indicate the accuracy that could be obtained with a builder's level and self-leveling attachment in prolonged field practice but obviously the field test proved the practicability of previously developed theory.

As a result of the test it can be shown that the angular probable error of a single observation from all accidental causes was approximately ±6 seconds at an average sight distance of about 194 feet. Horizontal eccentricity of the leveling attachment relative to the tilting point of the approximately

leveled instrument was one source of accidental error not encountered in ordinary instruments. However, the uncompensated error from this source should not have exceeded about 0.01 foot in the two-mile loop.

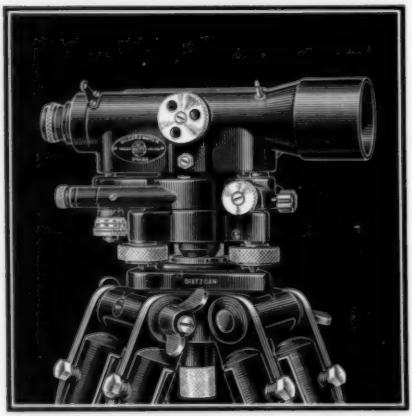
One may assume that in actual practice, without the self-leveling attachment, the builder's instrument used in the test would not be leveled to better than ±15″ arc (¼ division on a 60″ bubble). Neglecting other sources of error or assuming they are equivalent in each instance, it can be shown that by using a perfectly adjusted self-leveling attachment the break-even point of accuracy is about 25 feet in front of the instrument despite eccentricity of the attachment and approximate leveling to ±10′ arc. In other words, at all distances beyond about 25 feet the level and attachment would give better results than the original level alone. This corresponds with the results obtained in the test as compared with what one would normally expect from a builder's instrument.

Conclusion

The work covered by this paper is a continuing process, but a few specific conclusions, furthering knowledge in this field, can be presented at this time:

(1) Principles of theoretical engineering mechanics, particularly resistance of materials, can be used to design new flexural pivots for use in self-leveling instruments.

(2) Optical design of self-leveling instruments, particularly of the automatic-level type, can be greatly simplified by the use of a combination of theoretical mechanics and elementary optical principles.



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Additional State Laws Defining Land Surveying

Compiled by VICTOR H. GHENT

SECRETARY, PROPERTY SURVEYS DIVISION, ACSM

EDITOR'S NOTE.—The following material is an extension of the compilation previously published in SURVEYING AND MAPPING, January–March 1956, Vol. XVI, No. 1, pages 14–19.

COLORADO

"The practice of land surveying within the meaning and intent of this article includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment of land boundaries and the plotting of lands and subdivisions thereof." Six years experience for written examination.

FLORIDA

"A person practices 'Land Surveying' within the meaning of this Act, who reestablishes the original lines and corners of Townships, Ranges, Sections, and the subdivisions thereof, as established by the Surveyors deputized by the Surveyor General to survey the public lands of Florida; who subdivides the land in accordance with rules and regulations prescribed by the General Land Office and the laws of Florida; who surveys and otherwise determines on the ground the plane boundaries of tracts and parcels of land, traverses the boundaries of lakes, water courses, seacoast and similar natural features; who resurveys on the ground lines any subdivisions surveyed at a previous date by himself or other surveyors and who otherwise performs recognized acts of land surveying in connection with the establishing and re-establishing of boundaries of tracts of land." Three years of experience required for examination.

MASSACHUSETTS

" 'Land Surveying', or 'practice of land surveying' shall include surveying of land for any purpose." (Registration permissive and only required of anyone who calls himself a "Registered Land Surveyor.") Six years of experience required for written examination.

NEW MEXICO

"The practice of land surveying within the meaning and intent of this Act includes the application of a knowledge of mathematics and those principles of engineering required in surveying of areas for their correct determination and description and for conveyancing, or for the establishment or reestablishment of land boundaries and the plotting of lands and subdivisions thereof." Six years of experience required for written examination.

INDIANA

"The term 'Practice of Land Surveying', as used in this act, includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment, or re-establishment of land boundaries, and the plotting of land and subdivisions thereof." Four years of experience required for written examination

OREGON

" 'Professional land surveying' means and includes assuming responsible charge of the surveying of land for the establishment of corners, lines, boundaries, and monuments, the laying out and subdivision of land, the defining and locating of corners, lines, boundaries and monuments of land after they have been established, the survey of land areas for the purpose of determining the topography thereof, the making of topographical delineations and the preparing of maps and accurate records and descriptions thereof." Six years of experience required for written examination.

Puplic Relations Committee Activated

The following letter, received from Helmuth Bay, Chairman, Public Relations Committee, ACSM, is quoted in its entirety so that it may reach the entire membership of ACSM as quickly as possible.

"The Public Relations Committee of the American Congress on Surveying and Mapping is at present being activated by the Executive Committee, which feels that the time has come when efforts should be extended nationally to secure more publicity for the activities of the Congress and the technical fields it embraces.

"It will of necessity be a large committee with members scattered throughout the country who will send in items of interest relating to technical developments, individuals, meetings, or other events. These will then be sent out in the form of press releases for publication in the media best suited for the purpose of publicity.

"I would very much appreciate it if every member of the Congress would consider himself a reporter and send in all items which he feels have publicity value."

Items for use by this committee should be addressed to Helmuth Bay, Chairman, Public Relations Committee, American Congress on Surveying and Mapping, 1104 National Press Building, Washington 4, D. C.

National Bureau of Standards to be Relocated

A tract of approximately 550 acres of land near Gaithersburg, Md., has been selected for relocation of the Washington laboratories of the National Bureau of Standards. The move will permit the Bureau to plan new buildings to replace present research facilities, which over the past 50 years have become inadequate for current needs.

The new site was selected after careful consideration as most suited to the special requirements of the Bureau's scientific and engineering programs. The choice was based on a number of factors, including accessibility by railroad and highway as well as topography for certain technical projects.

The Congress appropriated funds for site acquisition and preliminary planning early in June after details about the proposed site had been presented to House and Senate Appropriation Committees. Plans for the site have been given to the National Capital Planning Commission and to the Regional Planning Council, and it is expected that these groups will work with the Bureau in utilizing the land. The General Services Administration will participate in planning and will supervise construction. Transfer of operations to the new location is expected to be completed in about five years.

The Bureau occupied its present site on Connecticut Avenue in Washington in 1903. Since that time its responsibilities have greatly increased, largely as a result of the rapid expansion of technology and the growth of scientific research. Extensive programs of research and development must now be conducted in the physical sciences and engineering to meet the needs of science and industry for new and improved standards and measurement methods. The new site will enable the Bureau to plan for a more up-to-date plant consistent with its continually increasing responsibilities.

Many of the buildings on the present site are temporary in nature, and even the permanent buildings are outmoded from the viewpoint of modern technology. Renovation and modernization of this plant would be very costly, amounting to more than half the estimated cost of a complete new facility. Space for further expansion is also lacking on the present site.

It is expected that the new location will make possible a more modern research operation in structures that can be very efficiently managed. In addition, the new site will provide the benefits of a rural location where scientific programs can be undertaken without interfering in community life and without interference to important Bureau projects. The rural location will remove the Bureau's work from the variety of mechanical, electrical, and atmospheric disturbances present in a city and will reduce the effect of these forces upon precise scientific measurements.

In addition to its Washington laboratories, the Bureau maintains a major research center in Boulder, Colo., and 20 widely scattered field stations. The Boulder Laboratories are concerned with radio-propagation research, radio standards, and cryogenic engineering. Most of the field stations are engaged in gathering data on radio propagation.

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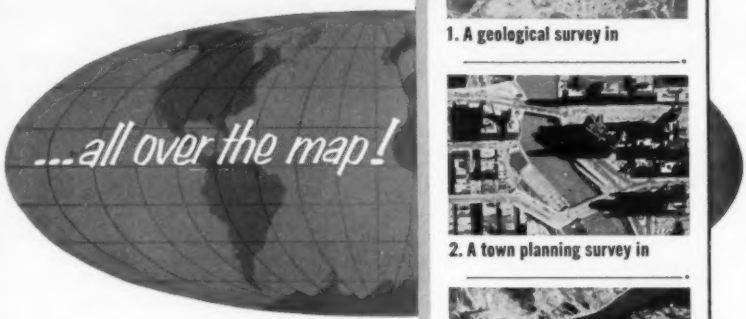

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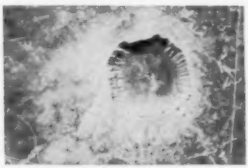

1. A geological survey in _____.

2. A town planning survey in _____.

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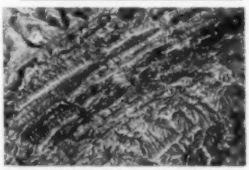

4. An airborne magnetometer survey in _____.

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MAGAZINE ARTICLES

General Interest

THE LAST VOYAGE OF JOHN CABOT AND THE ROCK AT GRATES COVE. Professor Arthur Davies. *Nature* (London), Vol. 176, No. 4491, November 26, 1955. (Brief but scholarly paper on the voyage and its reflection in European cartography, notably the de la Cosa map.)

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BOUNDARIES ABUTTING WATER IN BRITISH COLUMBIA. W. A. Taylor. *The Canadian Surveyor,* Vol. 13, No. 1, January 1956. (Discussion of a controversial matter.)

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WORLDS IN THE MAKING. Robert M. Hyatt. *Think,* publication of the International Business Machines Corporation, Vol. 21, No. 1, October 1955. (Account of a visit to a globe-manufacturing concern.)

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Instruments

CORRECTIONS TO THE TENSION IN A SURVEYING TAPE FOR THE EFFECT OF THE TOTAL LOAD BETWEEN THE MEASURING HEAD AND THE STRAINING WEIGHT. Marcelle Pearce. *Empire Survey Review,* Vol. 13, No. 100, April 1956. (Technical discussion.)

AN IMPROVED INSTRUMENT FOR MEASUREMENT OF TIDAL VARIATIONS IN GRAVITY. H. N. Clarkson and L. J. B. LaCoste. *Transactions, American Geophysical Union,* Vol. 37, No. 3, June 1956. (Description of an instrument designed for measurements of very high accuracy, illustrated by a number of diagrams.)

Property Surveys

HISTORICAL OUTLINE, ASSOCIATION OF MANITOBA LAND SURVEYORS. W. E. Hobbs. *The Canadian Surveyor,* Vol. 13, No. 1, January 1956. (Review of interesting events.)

FOREST MAPPING FOR THE FOREST INDUSTRY IN NEW BRUNSWICK. E. L. Howie. *The Canadian Surveyor,* Vol. 13, No. 1, January 1956. (Discussion of the general requirements for maps to serve foresters not always skilled in map reading.)

DEVELOPMENT OF SURVEYING IN JAMAICA. A. J. Butterfield. *The Canadian Surveyor,* Vol. 13, No. 1, January 1956. (Interesting historical discussion of surveying procedures in a relatively little-known area.)

TANGENTIAL METHOD FOR RECONNAISSANCE SURVEYS. E. Seaton. *The Australian Surveyor,* Vol. 16, No. 1, March 1956. (Technical discussion of method.)

Topography

NOTES ON THE NISTRI PHOTOSTEREOGRAPH MOD. BETA/2. D. Ugo Bartorelli. *Photogrammetria,* Vol. 12, No. 2, 1955–1956. (Describes the concept and construction of an extremely precise plotting instrument.)

AERIAL PHOTOGRAPHIC INTERPRETATION. Ralph W. Kiefer. *The Cornell Engineer,* Vol. 21, No. 5, February 1956. (Describes methods of aerial photo analysis and its fields of application.)

BOOKS AND PAMPHLETS

COURS DE DESSIN TOPOGRAPHIQUE. R. Couet and B. Dubisson. Paris, 1955. 118 pp., 116 figures, and 1 folding plate. (Elementary course in topographic drawing; French text.)

BRITISH SCIENTIFIC INSTRUMENTS 1956. Scientific Intsrument Manufacturers Association of Great Britain Ltd., 20 Queen Anne Street, London W-1. 432 pp. Price $3.50 post free to the United States.

INTERNATIONAL COOPERATION ON CARTOGRAPHY. United Nations, Economic and Social Council. Report of the Secretary-General. New York, 1956, 45 pp. (United Nations. Document E/2823.)

MODERN SURVEYING FOR CIVIL ENGINEERS. Harold Birchal. Philosphical Library Inc., 15 E. 40th Street, New York 16, N. Y. Second edition, 528 pp., $15.00.

SURVEYING FOR CIVIL ENGINEERS. Philip Kissam, McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 716 pp., $8.50.

WHERE IS WHERE. Ambrose Ryder. Carmel Co., Carmel, N. Y., 1956. 48 pp., maps.

WORLD CARTOGRAPHY, Vol. III, 1953. United Nations, Department of Economic and Social Affairs, New York, 1955. United Nations Publication Sales Number: 1955. I. 30. Price 60 cents. Also available from International Documents Service, Columbia University Press, 2960 Broadway, New York 27, N. Y. (In addition to several papers of general interest to surveyors and mappers, this volume contains a provisional list of governmental agencies in the field of surveying and mapping including the publication of special-purpose maps.)

SYMBOLS FOR LARGE SCALE MAPS, NO REDUCTION. U. S. Army Map Service. Edition 2, February 1956. Washington, 1956. 77 pp. (AMS Technical Manual No. 23A).

SURVEY OF INDIA, GENERAL REPORT, 1952. Published by order of Brigadier I. H. R. Wilson, Surveyor General of India. Survey of India, Dehra Dun, 1955. 78 pp., index maps. (Covers period 1 April 1951 to 31 March 1952.)

SURVEY OF INDIA, TECHNICAL REPORT, 1952. Printed at the Office of the Geodetic and Research Branch, Dehra Dun, 1955. 47 pp., index maps. (Contains Part I, Topographical and Other Surveys and Part II, Map Publication and Office Work.)

ANNUAL REPORT OF THE SURVEY DEPARTMENT, 1954–55. Sudan Government. Karthoum, 1955. 39 pp. (processed), index maps.

HISTORICAL RECORDS OF THE SURVEY OF INDIA. Volume III 1815, to 1830. Collected and compiled by Colonel R. H. Phillimore. Published by order of the Surveyor-General of India. Dehra Dun, India, 1954. xxii and 534 pp., maps.

GLOSSARY OF SELECTED GEOLOGIC TERMS. William Lee Stokes and David J. Varnes. Colorado Scientific Society Proceedings. 165 p. Cloth bound, $3.50; paper bound, $2.75.

LEGAL CASES FOR CONTRACTORS, ARCHITECTS AND ENGINEERS. I. Vernon Werbin. McGraw-Hill Co., New York. 487 pp. $6.00.

YEAR BOOK OF REGISTERED PROFESSIONAL ENGINEERS AND LAND SURVEYORS, 1956. Louisiana State Board of Registration for Professional Engineers and Land Surveyors. New Orleans, 1956. 110 pp.

OPERATION OF THE OFFSET PRESS. Theodore F. Makarius. American Graphic, Inc., 451–453 Coit St., Irvington, N. J., $10.00.

ASTRONOMY APPLIED TO LAND SURVEYING. Prof. R. Roelofs. N. V. Wed. J. Ahrend & Zoon, P. O. Box 70, Amsterdam, Holland.

—LYMAN D. LYNN
Coast and Geodetic Survey

DISTINCTIVE RECENT MAPS

The World Makes an Automobile is the title of an interesting and instructive map published by the Automobile Manufacturers Association, New Center Building, Detroit 2, Michigan. "Materials used in a motor vehicle" are located on a map of the world and keyed to a legend on the border. On the upper and lower margins of the sheet there are small sketches and descriptions of the basic materials which are used in automobile manufacture. The map, which measures 21½ by 37 inches, was prepared by General Drafting Co., Convent Station, New Jersey.

Several new three-dimensional plastic relief models have recently been placed on the market by Aero Service Corporation of Philadelphia. The *Aero Relief Map of the World* is at the scale of 1:27,500,000 and measures 39½ by 51½ inches. The map is on the Van der Grinten projection and shows relief by color gradations as well as by embossing.

Aero has also issued a new edition (the fourth) of its relief map of *The United States of America* which was first published several years ago.

The *Aero Relief Map of Canada* is at the scale

of 1:4,752,000 and measures approximately 41 by 45½ inches. In addition to three-dimensional relief the map shows, in different colors, irrigated land, other cultivated land, grazing land, forests, tundra, and areas of permanent ice and snow. Administrative boundaries, major highways, and railroads are also indicated. The map limits include the northern reaches of the United States as well as portions of Alaska and Greenland.

The rapidly growing network of toll roads in the United States is shown on the *Turnpike Guide-Map* published in 1956 by Parade Publications Inc., and Famous Features Syndicate. In addition to turnpikes, existing and under construction, the map shows a number of dual multilane roads and expressways and "other free highways". On the verso of the map is a chart giving mileages and average driving time between major cities. The map measures 15 by 21 inches. No scale is given.

Interest in uranium prospecting is still active, and map producers are attempting to aid prospectors in their searches. A recent issue is the *Uranium Map of the Colorado Plateau,* published in January 1956 by Minerals Map Company, 1175 Mission Road, Salt Lake City, Utah. The listed price is $5.50. The map, compiled and drafted by H. A. Saalfeld, shows uranium bearing formations, uranium mines and prospects, ore buying stations and processing mills, and completed surveys and highways. It measures 37 by 32 inches and is at the scale of 1:500,000.

The U. S. Geological Survey recently announced publication of a series of 18 geologic maps covering the important Uravan belt in southwestern Colorado. The maps, using recently completed 1:24,000 topographic quadrangles for base maps, were prepared in cooperation with the United States Atomic Energy Commission, the Colorado Geological Survey Board, and the Colorado Metal Mining Board.

The maps of the Uravan Belt are issued in the series of "Geologic Quadrangle Maps of the United States" which replaces the Geologic Atlas series which was published in numbered folios between 1894 and 1945. Copies of the Geologic Quadrangle Maps may be ordered, at one dollar each, from Geological Survey Distribution Centers at Washington 25, D. C. and Denver 2, Colorado.

A new base map of Pennsylvania, at the scale of 1:500,000 has been published by the U. S. Geological Survey in two separate editions. A multicolored topographic edition shows land forms, principal drainage features, county and state boundaries and county seats, as well as a selection of named geographic features. Also available is a five-color highway and contour edition at the same scale.

Both maps measure 42 by 29 inches and are based on published topographic quadrangles of the State. Pennsylvania has been completely mapped at the scale of 1:62,500 in 15 minute quadrangles. In recent years a number of areas have been remapped at the scale of 1:24,000. In all, some 661 quadrangles are available for Pennsylvania.

Three maps of Nicaragua, at the scale of 1:1,000,000, were published in 1954 by the Departamento de Carreteras of that country. *Mapa Fisico de Nicaragua* shows generalized relief by hypsometric tints, as well as major transportation routes and populated places.

More detailed representation of highways, and distribution of population are found on *Nicaragua Mapa Parcial de Caminos.*

Nicaragua Uso Economico de la Tierra, shows distribution of the major types of land utilization. Of especial interest are the zones of "intensive" and "less intensive" cultivation in the western part of the country. All three maps measure 24 by 20 inches.

The mountainous core of Colombia, centered on Bogota, is portrayed in shaded relief on the *Mapa Preliminar del Departamento de Cundimarca.* It was compiled by the Instituto Geografico de Colombia, and published in 1954 by the Banco de la Republica. The scale is 1:250,000 and the size 39 by 33 inches. An enlarged inset map shows Bogota and environs at the scale of 1:75,000.

The Allgemeiner Deutscher Automobil-Club, Munich, Germany, published in 1956 a motoring map of western Germany. The scale is 1:800,000 and the dimensions 43 by 29 inches. Distances, in kilometers, are given between towns and road intersections.

Bodenkundliche Übersichtskarte von Bayern is a colorful soil map of the province of Bavaria. It was compiled by F. Vogel, with the assistance of K. Brunnacker, and published at Munich in 1955 by the Bayerischen Geologischen Landesamt. Thirty-nine soil types are shown on the map which measures 36 by 34 inches. The scale is 1:500,000. A climate map, at the scale of 1:2,500,000, is an inset on the map sheet.

Carte de Service de la Province de Luxembourg shows details of the road and railroad network of the Duchy of Luxembourg. Two classes of railroads, and five classes of roads are indicated. The map is at the scale of 1:100,000 and measures 42 by 32½ inches. It was published in 1955 by Administration des Ponts et Chausses of Luxembourg.

Principales Voies de Communication de l'Afrique du Nord, is a transportation map of North Africa. It was published, at the scale of 1:2,000,000, by Ministère des Travaux Publics et des Transports, Institut Géographique National, Paris. The map shows four classes of roads, with mileages between major points, and railroads of

three different gauges. The measurements are 24 by 39½ inches.

The Imperial Highway Authority of Ethiopia [Addis Ababa] published in 1955 a *Highway Map of Ethiopia* at the scale of 1:2,000,000. It shows railroads, three classes of roads, national and provincial boundaries, and airfields and landing strips. The map, which measures 35½ by 36 inches, was lithographed by A. Hoen and Company of Baltimore.

The Hagstrom Map Company of New York has prepared, for the Arab Information Center, a map of *The Strategic Arab World*. It shows in outline the Arab states extending from Morocco and Tangiers on the west to Iraq, Kuwait and Saudi Arabia on the east, and to the Sudan on the south. Varying shades of green differentiate states which are affiliated with the Arab League and those which are not members. Major mineral deposits, military bases, petroleum sources and pipelines, historic and holy sites, political boundaries and railway lines are shown on the map. The scale is 1:7,500,000 and the dimensions 27 by 37 inches.

Land und Leben des Herrn is a colorful and decorative map of the Holy Land compiled and drafted by Karl Pieper, Joseph Goecken and Willy Lütcke. It was published in 1956 by Willy Grosschen, Dortmund, Germany. The map is oriented with east at the top of the sheet as was the practice on ancient maps of this area. The city of Jerusalem, as it was in Biblical days, is shown pictorially on an inset. The map measures 24 by 51 inches.

An *Economic Map of the Philippines* was published in 1954 by the Research and Publications Division, Department of Commerce and Industry [Manila]. The map, which is issued as a blue-line print, is decorated with sketches of various economic products produced in the republic. There is an inset map of Manila and suburbs. The scale is 1:1,600,000 and the map measures 47½ by 32½ inches.

Carte Économique de L'Australie et de la Nouvelle-Zelande is No. 74 in the series of useful and informative maps compiled and published by France's Ministère des Finances and des Affaires Economiques, Direction de la Documentation. It was printed by l'Institut Géographique National. Industries, minerals, and major regions of agricultural production are located on the map which is at the scale of 1:6,000,000. Measurements are 26 by 36½ inches.

WALTER W. RISTOW
Library of Congress

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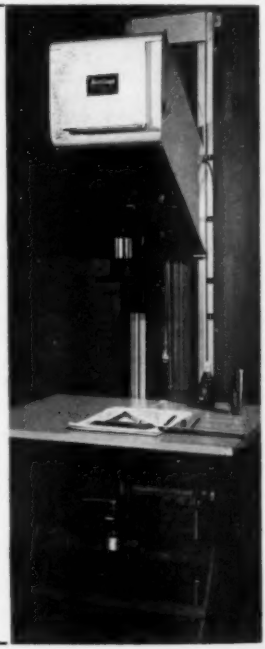


Books in Review

INTERNATIONALE STRECKEN-MESSKURSE IN MÜNCHEN. M. Kneissl, President of the German Geodetic Commission, Director of the Geodetic Department of the Munich Institute of Technology. *Marianne Wittke Verlag,* Goslar, 1955. 221 pp.

To the engineer with a knowledge of the German language this book presents "the latest developments in geodetic instruments and advances in optical distance measurement." It consists of 24 essays representing a selection from a series of lectures given at Munich in September 1953 by eminent members of the geodetic faculties of various universities and factory representatives of well-known Central European instrument makers. It is planned to repeat and develop this course at two-year intervals and the editor, Prof. Kneissl, hopes to coordinate the material of these lectures and the experience of the participants in a forthcoming new edition of the second volume of the Jordan-Eggert "Handbuch der Vermessungskunde" with which the publishers have charged him. The book is well illustrated but the type seems too small for comfortable reading. The following translation of the titles of the individual papers will give some indication of the nature of the contents. (It should be borne in mind that the Germans use the words geodesy and surveying almost interchangeably.)

Kneissl, M., Survey of the development of measuring geodetic distances. *Förstner, G.,* Foundations of optical distance measurement (d.m.) *Schwidefsky, K.,* Problems in photogrammetric d.m. *Schwidefsky, K.,* Sources of error in optical d.m. *Schneider, W.,* Types of optical d.m. instruments. *Schneider, W.,* Use of optical d.m. instruments. *Kruidhof, A.,* Elimination of optical errors by systematic d.m. *Kobold, F.,* Experience gained through d.m. with the two-meter subtense bar. *Haller, R.,* New tripods by Kern. *Pichl,* The mapping tachygraph and its use. *Zwickert, E.,* The Otto Fennel Söhne products. *Rellensmann, O.,* Diagram tacheometry by the Hammer-Fennel method. *Hofmann, W.,* The Breithaupt-Berroth d.m. *Heckmann,* Experiences with the Breithaupt-Heckmann precision-wire d.m. *Heckmann,* The new Breithaupt-Heckmann level. *Conzett, R.,* A new self-reducing Kern tacheometer with vertical rod. *Conzett, R.,* The geodetic instruments of Kern, Aarau (Switzerland). *Berchtold, E.,* Image separation in the double image tacheometers. *Berchtold, E.,* Contribution to the development of theodolites by Wild-Heerbrugg. *Ramsayer, K.,* Function-computing machines and their use in geodesy. *von Platen, Jürgen,* The Brunsviga computing machine. *Drodofsky, M.,* The Zeiss, Ni2 level. *Wittke, H.,* Electricity as a means for geodetic observation. *Jäger, Rolf,* New plotting instruments for rectangular and polar coordinates.

ERWIN SCHMID

Coast and Geodetic Survey

MY STORY. Otto G. Lindberg, General Drafting Co., Inc., Convent Station, N. J., 1955.

The General Drafting Company of Convent Station, New Jersey, is one of America's "Big Three" in the production of oil-company road maps. It shares with Rand McNally and Company and the H. M. Gousha Company responsibility for preparing some 125 million road maps each year for free distribution at oil-company service stations.

Founder and president of General Drafting Company is Otto G. Lindberg, who emigrated from Finland to the United States in 1907 at the age of twenty-one. Within two years the enterprising young Finn had established his own drafting company in New York City. In 1911 Lindberg entered the roadmap field with preparation of five small roadmaps, for the American Automobile Association, which were published in the April 1911 issue of *The American Motorist.*

A few more maps were prepared by General Drafting during the next decade, but it was not until the early twenties that the company entered wholeheartedly into cartographic production. In 1923 a contract was signed with Standard Oil Company of New Jersey for preparation of a road map of New Jersey. Maps of other states shortly followed, for Standard of New Jersey as well as for several other oil companies.

General Drafting was now in the road map business up to its ears, and before long was operating free tour services for its clients in addition to preparing maps. For more than thirty years now the company has specialized in roadmaps, except during World War II, when military maps were prepared, on contract for the Army Map Service.

My Story is written in simple, straightforward

style, and is hardly a literary masterpiece. It does present, however, an interesting chapter in the history of American commercial mapmaking.

WALTER W. RISTOW

Library of Congress

LAND SURVEY DESCRIPTIONS. William C. Wattles. *Title and Insurance Trust Company,* Los Angeles, California. 136 pp.

The author needs no introduction to the members of ACSM but to the casual reader let it be said that he is unquestionably one of the most competent title engineers both at home and abroad and a recognized expert in the field of conveyancing. His current presentation is a syllabus of lectures, papers, and research on description and survey in their relation to California land titles. The value of this accumulated material, presented in manual form, will be quickly appreciated by the specialist in this field of activity, and should be of interest to all practicing land surveyors.

The aims and objectives of this publication are perhaps best stated by the author in his preface, viz: "The frequent errors or ambiguities of description in instruments of record, and the litigation arising therefrom, indicate the need of a treatise on the construction and interpretation of descriptions of real property as applied to conveyancing and other matters dealing with land. Necessary also is the practical application of the technique of such interpretation to physical survey location of land boundaries.

"Too often does the safety of a title or a financial security rest on the weak thread of a poorly drawn description or improperly executed survey therefrom.

"Documents are invalidated or the intent thereof distorted by inexperienced assembly of phrases, or by a misconception of the meaning of the terms used.

"There exists a definite gap in the technical literature of today on the proper and intelligent use of forms and phrases in description, that necessary link between the actual land holding and the title record of it.

"It [the syllabus] is intended as a reference and a general summary of factors which enter into the proper development of correct description and accurate analytic survey procedure of title to land as disclosed by the recorded instrument.

"These notes are not to be considered a complete treatise on the subject, but as a guide and outline to be filled in by additional research and comparison with other data."

A brief review of the contents includes comments, first of all, on the essential features of descriptions and examples embodying these basic elements. Under this heading descriptions are given careful analysis and suggestions are made for their preparation in all form types including lots or parcels, metes and bounds, and special cases. This section should be of general interest to the profession as a whole inasmuch as there are many technical illustrations together with definitions of legal terminology.

The next topic is concerned with a discussion of sectional properties in general followed by a treatise on easements and vacations that is of particular interest to this reviewer due to its broad application. A fundamental and vital part of land surveying is the relocating and establishing of lost or obliterated monuments, as all practicing surveyors realize. This fact is emphasized and various phases of procedure incidental to this subject discussed and recommended in a chapter set aside for survey location.

Climaxing the material heretofore presented is a chapter on the interpretation of the factors involved in the preparation of a concise valid description and its relation to the legal and physical boundary location. This portion deals with specific definitions and illustrations of particular interest to the surveyor because of their fundamental nature and value.

The remainder of the syllabus is concerned with handy reference material including words and phrases, abbreviations and characters, calculations and short methods, approximations, map laws, records and recordation of documents, and descriptive variance, the latter profusely illustrated with diagrams and examples. Prefacing the index is a careful compilation of the values of the *vara* in various countries and localities.

This publication is heartily recommended for its value to the practicing land surveyor who is concerned with a substantial amount of rebounding and conveyancing work, particularly in connection with legal firms and/or title and abstracting concerns.

GORDON E. AINSWORTH

American Congress on Surveying and Mapping

SURVEYING FOR CIVIL ENGINEERS. Philip Kissam. *McGraw-Hill Book Co.* 716 pages.

This book with its several appendages (5 parts) covers a much wider area of treatment

of surveying and its allied subjects than the normal textbook. In addition to an up-to-date presentation of the customary surveying methods and procedures a rather extensive exposition is devoted to: Errors, Probability; Least Squares and its applications to adjustments of Level, Traverse, and Triangulation nets, and the Theory of State Coordinate Systems, together with miscellaneous tables.

This book is a refreshingly different approach to the subject from the usual run-of-mill rehash of previously published material that so frequently (and, this writer might add, so unnecessarily) floods the market from time to time. To be sure the subject embraces an old art that, until comparatively recently, has remained more or less static and hence much of the development of the various theories and techniques must of necessity follow along well established lines. The difference here is that the author employs an unique and individual style of analysis and delineation that sets it apart from "just another text on surveying."

The coverage of the several branches of surveying and its associated topics—taping, angle measurement, levels, stadia, aerial mapping, etc.—appears to be rather thorough, up-to-date, and in general clearly defined. The author's words in the preface "the engineer must become familiar with the newest types of surveying equipment and techniques, as well as with the theory and application of the advanced types of surveying procedures . . . " indicates his over-all aim in this work and it must be said that he has hewed close to the line. This is not to say, however, that there are no questionable or controversial areas or statements that need clarification or correction.

As stated the book is divided into five parts, each more or less taking up progressively more unusual or more precise treatment of material in the preceding parts. Again, in the author's words, this arrangement is such that, if used as a text in surveying courses, once Part 1 has been covered a course may be terminated whenever desired; but recommends however that a minimum course should include Part 2 and at least some of the sections on aerial mapping. At first thought this seems to be fairly logical, but the division of the several branches into separate parts results in considerable repetition and some little confusion. For example, the treatment of errors is first taken up in part of Chapter 1 and, although a statement is made that Chapter 21 is devoted to this subject, frequent references are constantly being made to formulas and tables contained only in the latter chapter, causing the reader much annoyance in turning the pages back and forth to follow the context. Other topics are also similarly divided in much the same fashion—leveling in Chapters 2, 6, 17, and 22; angle measurement in Chapters 4, 6, 18, and 22; and so with other subjects. Consequently the net result is rather a feeling of frustration which, to this writer, far outweighs the originally stated purpose and consequently detracts from its usefulness.

In addition to the division of certain topics into the several separate areas, it is believed that the inclusion of so much detailed treatment of the adjunct subjects of Probability, Least Squares and its applications, The Theory of State Coordinate Systems, and certain of the tables is rather superfluous. Let it not be misunderstood that the value of these subjects is underestimated or unappreciated. Indeed the modern surveyor must have much more than a nodding acquaintance with these subjects which he will find quite necessary and highly useful. It seems however that a fairly brief presentation of the most pertinent aspects accompanied by complete and adequate references to definite publications that deal solely and minutely with the several topics would be much more appropriate—after all the development of calculus and trigonometry is never included in surveying texts.

The coverage of horizontal, angular, and vertical measurements along with numerous methods of adjustment procedure is unusually well presented. The practical application of these types of measurements to various projects —Topographic, City, Boundary, Mine, Bridge, and Tunnel Surveys—is clearly delineated. The treatment of precision to be obtained with various instruments should also include an analysis of the subtense bar—the simple statement that second-order accuracy and better can be attained with sights ¼ mile long (using 100 ft. tape) is open to considerable question.

It was rather surprising to find the computation of areas limited to the old DMD method with no reference whatever to the use of coordinates—this in spite of the very considerable amount of space allotted to State Coordinates, etc.

The section on Celestial Observations, with the inclusion of some tables that are ordinarily found in the ephemeris or almanac, is somewhat too extensive. Methods describing the finding of position which is limited to "the

nearest mile" are only appropriate to sea navigation and could be eliminated without undue loss. In other parts of the book much effort is devoted to the development of certain formulas whereas here several new formulas are set forth with no explanation.

The section on Hydrographic Surveys is only partially modernized. Much of the description of this work is extremely naive and would only be employed over very small and limited areas. The discussion of the General Theory of Tides and the Establishment of a Tidal Datum seems rather nonessential as it would have limited application to special cases where adequate procedure could then be obtained from appropriate publications. Considerably more space could have been allotted to Stream Gaging to advantage, including additional streamflow and weir formulas and tables of constants, especially those that otherwise must be obtained by tedious computations.

Throughout the text there are a moderate number of problems, however, no answers are provided, which would be highly desirable.

In the questionable or controversial realm may be listed the manner of detremining the number of repetitions necessary for a given angle precision, the finding and application of level tilt errors, and a graphical solution.

Example 4 on pages 10 and 11 is designed to find the number of repetitions necessary with a *1-minute transit* in order to close a triangle with an error of *3 seconds or less*. The solution derived is 15 repetitions of 8 D&R! Now to close a triangle within this tolerance calls for second-order work which, as correctly shown in Table 18–1, page 502, requires *2–3 sets of 6 D&R* with a *10 second* repeating theodolite. (Hence 24 to 36 repetitions with a 10 second instrument versus 15 repetitions on a 60-second instrument!) Parenthetically it may be observed that figure 1–4, page 10, should be more completely described as to purpose, units or dimensions, and the relationship of the indicator dial readings to the given distance. While its purpose may be reasonably obvious to the experienced surveyor, the student or neophite would doubtless find it next to meaningless. It also appears fitting at this point to direct attention to the error of "$\sqrt{3} \times 3'' = 1.73''$" at the top of page 11.

The treatment of the level tilt error and correction (pages 50, 51 and 476–479) leaves much to be desired. The derivation of the correction factor C_i is much more involved than is the usual textbook practice, and its application as a final correction is all but lost in the apparent disregard of plus and minus signs. The wording used throughout this discussion is extremely awkward and confusing and could and should be greatly simplified. Assignment of appropriate plus and minus signs to all rod readings (both for height and distance) followed by the correct procedure in combining them arithmetically and algebraically would certainly be less ambiguous than "If the sum of the lengths of the minus sights was greater, the excess [???] of the plus sights would have a minus sign and the correction . . . . would be multiplied by a minus quantity." It should be further noted that there are two small errors in the numerical derivations of the above values. Formula (2–3), page 50, gives C_i equal to a minus quantity which, although correctly shown eventually, does not appear immediately below the tabulation on page 51. On page 479 the level loop error is given as -0.018 foot with the plus sights exceeding the minus sights by 317 feet. The correction therefore should be listed as -0.057 foot *per 1000 feet* of excess plus sights versus *per foot*. In the following sentence the correction then should be shown as *0.012* $(-0.057) = 0.001$ foot.

It is gratifying to see more graphical or semigraphical solutions being incorporated in texts, as presented in section 6–36, pages 157–161. It goes without saying that such methods should be clear and free of errors or nonexplanatory lines or figures. In this instance the solution and diagrams are clear and correct up to the next to the last line on page 160 where the point X_2 scaled from figure 6–31 does not quite appear to be as the value given—this in itself is rather immaterial. (It is suggested that it would be quite helpful if both points X_1 and X_2 on figure 6–31 and X_2 and X_3 on figure 6–32 were spotted and labeled.) The next computation and/or plotting on figure 6–32 appears to be in error inasmuch as the recomputed line *B–B* should pass through the point where X_2 should be plotted; the final scaling of point X_3 does not appear to be accurate to the nearest hundredth of a foot.

There are numerous typographical errors, inevitable in a new book. However, they should be spotted and corrected without delay. To cite a few: Page 8: E_{50} is shown as equal to both 0.218 and 0.217.

Reference is made to non-labeled Eq. 21–27.

Two statements—"as stated previously"—where?

Page 48: Reference to Table 1–1 (vs. Table 1–2)
Page 179: Reference to Figs. 7–10b and 7–12b (no "b" in the figures)
Page 508, Example 18–6:
Reference to Fig. 18–1 (vs. 18–2).
Reference to Table 18–1 (vs. 18–3).
Page 606, Fig. 21–1: Units read "in." (vs. seconds).

In conclusion it must be recalled that the title to this book is "Surveying for Civil Engineers" which surely carries the implication that experienced people should know how to use and make the best of it. With this thought in mind the author has done a remarkably good job in bringing together under one cover all the miscellaneous facets that have bearing on the subject. For use as a text for students it should be handled only by experienced instructors who would be able to provide the proper guidance.

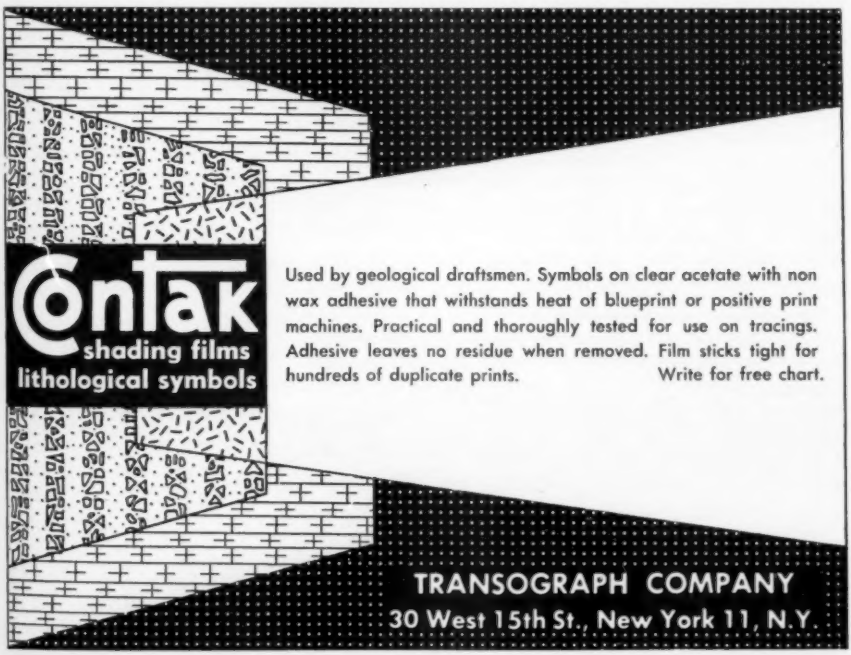
—Raymond P. Eyman
The George Washington University

Deep-Water Anchorage

Anchoring a ship in deep water is one of the problems which seems to have been solved by the French research ship *Calypso*—Captain Jacques-Yves Cousteau commanding—by the use of nylon cable. The ship was anchored over the Romance Trench in the Atlantic Ocean, where the depth is 4.6 statute miles, using a nylon cable of approximately ½ inch diameter.

The *Calypso*, which has been operating in cooperation with the National Geographic Society, lowered photographic equipment to the bottom of the Trench on nylon cable less than ¼ inch in diameter. Plans call for later photography in the Challenger Deep in the Pacific Ocean near Guam if the photography in the Romance Trench proves successful.

Cameras and lighting equipment, designed by Harold E. Edgerton of the Massachusetts Institute of Technology, have already been used successfully in depths of over 2½ miles in the Mediterranean Sea.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MAP INFORMATION

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that through an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession.

—EDITOR

Topographic Maps

THE FOLLOWING quadrangle maps were published by the U. S. Geological Survey between March 1 and May 31, 1946. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise designated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland. These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown—except those marked with the letter (P), which are planimetric); water features (in blue); works of man, including cities, towns, and scattered habitations, schools, churches, railroads, roads and boundaries, place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by Bureau of Land Management Surveys, township and section lines are shown. The State rectangular coordinate systems are indicated in the margins of the maps. An information folder further describing topographic maps is available on request.

Standard quadrangle maps may be obtained for 20 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C., (or Denver 15, Colorado, for maps of areas west of the Mississippi River).

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* Indicates 15-minute quadrangle; all others are 7½-minute quadrangles.
[1] Indicates a revised map.
[2] Indicates a series-converted map.
† Indicates availability in either a contour or a shaded-relief edition.
‡ Indicates preliminary black and white edition.

Alaska

AFOGNAK (C-5)*—Third Judicial Division
AFOGNAK (C-6)*—Third Judicial Division
AFOGNAK (D-4)*—Third Judicial Division
AFOGNAK (D-5)*—Third Judicial Division
AFOGNAK (D-6)*—Third Judicial Division
FAIRBANKS (B-6)*—Fourth Judicial Division
FAIRBANKS (C-6)*—Fourth Judicial Division
ILIAMNA (A-1 and A-2)*—Third Judicial Division
ILIAMNA (A-3)*—Third Judicial Division
ILIAMNA (A-4)*—Third Judicial Division
ILIAMNA (A-5)*—Third Judicial Division
ILIAMNA (A-6)*—Third Judicial Division
ILIAMNA (A-7)*—Third Judicial Division
ILIAMNA (A-8)*—Third Judicial Division
ILIAMNA (B-5)*—Third Judicial Division
ILIAMNA (B-6)*—Third Judicial Division
ILIAMNA (B-7)*—Third Judicial Division
JUNEAU (A-2)*—First Judicial Division
KANTISHNA RIVER (A-3)*—Fourth Judicial Division
KANTISHNA RIVER (A-4)*—Fourth Judicial Division
KANTISHNA RIVER (B-2)*—Fourth Judicial Division
KANTISHNA RIVER (B-3)*—Fourth Judicial Division
KANTISHNA RIVER (C-2)*—Fourth Judicial Division
KARLUK (D-6)*—Third Judicial Division
MT. FAIRWEATHER (C-1)*—First Judicial Division
MT. FAIRWEATHER (C-2)*—First Judicial Division
MT. FAIRWEATHER (D-2)*—First Judicial Division

MT. KATMAI (A-1)*—Third Judicial Division
MT. KATMAI (A-2)*—Third Judicial Division
MT. KATMAI (A-5)*—Third Judicial Division
MT. KATMAI (A-6)*—Third Judicial Division
MT. KATMAI (B-2)*—Third Judicial Division
MT. KATMAI (B-5)*—Third Judicial Division
MT. KATMAI (B-6)*—Third Judicial Division
MT. KATMAI (C-1)*—Third Judicial Division
MT. KATMAI (C-2)*—Third Judicial Division
MT. KATMAI (C-3)*—Third Judicial Division
MT. KATMAI (C-4)*—Third Judicial Division
MT. KATMAI (C-5)*—Third Judicial Division
MT. KATMAI (C-6)*—Third Judicial Division
MT. KATMAI (D-1)*—Third Judicial Division
MT. KATMAI (D-4)*—Third Judicial Division
MT. McKINLEY (A-5)*—Fourth Judicial Division
MT. McKINLEY (B-4)*—Fourth Judicial Division
MT. McKINLEY (C-4)*—Fourth Judicial Division
MT. McKINLEY (C-5)*—Fourth Judicial Division
MT. McKINLEY (D-4)*—Fourth Judicial Division
MT. McKINLEY (D-5)*—Fourth Judicial Division
NAKNEK (C-1)*—Third Judicial Division
NOME (C-1)*—Second Judicial Division
NOME (D-1)*—Second Judicial Division
NOME (D-2)*—Second Judicial Division
NOME (D-3)*—Second Judicial Division
NOME (D-4)*—Second Judicial Division
NORTON BAY (B-4)*—Second Judicial Division
NORTON BAY (C-6)*—Second Judicial Division
NORTON BAY (D-5)*—Second Judicial Division
NORTON BAY (D-6)*—Second Judicial Division
SITKA (A-6)*—First Judicial Division
SITKA (B-4)*—First Judicial Division
SITKA (B-5)*—First Judicial Division
SITKA (B-6)*—First Judicial Division
SITKA (C-4)*—First Judicial Division
SITKA (C-5)*—First Judicial Division
SOLOMON (B-2)*—Second Judicial Division
SOLOMON (B-3)*—Second Judicial Division
SOLOMON (B-6)*—Second Judicial Division
SOLOMON (C-1)*—Second Judicial Division
SOLOMON (C-2)*—Second Judicial Division
SOLOMON (C-3)*—Second Judicial Division
SOLOMON (C-4)*—Second Judicial Division
SOLOMON (C-5)*—Second Judicial Division

Arizona

DOME—Yuma
FORT HUACHUCA*[2]—Cochise
‡FREDONIA NE—Coconino
‡FREDONIA NW—Mohave
‡FREDONIA SW—Mohave
‡HEATON KNOLLS SE—Mohave
LOCHIEL*[2]—Santa Cruz
LOS GIGANTES BUTTES*—Apache
NAVAJO CREEK*—Coconino
RED BLUFF MTN.*—Yuma
ROLL—Yuma
‡SHORT CREEK NE—Mohave
‡SHORT CREEK NW—Mohave
‡SHORT CREEK SE—Mohave
‡SHORT CREEK SW—Mohave
SHINUMO ALTAR*—Coconino
SUNNYSIDE*[2]—Cochise

Arizona-California

CIBOLA—Yuma
IMPERIAL RESERVOIR—Yuma
LAGUNA DAM—Yuma

Arizona-New Mexico

REDROCK VALLEY*—Apache

Arizona-New Mexico-Utah-Colorado

PASTORA PEAK*—Apache

Arizona-Utah

TOH-ATIN MESA*—Apache

Arkansas

MARKED TREE*[1]—Poinsett
McGEHEE*—Desha

Arkansas-Mississippi

LA TOUR*—Phillips
PARK PLACE*—Lee

California

ANTELOPE PLAIN[1]—Kern
AVENAL GAP[1]—Kings
CHITTENDEN—Santa Cruz
CREVISON PEAK—Stanislaus
DAVIS*[1]—Yolo
DESERT HOT SPRINGS—Riverside
DUDLEY RIDGE[1]—Kings
EMIGRANT HILL[1]—Kern
FREDONYER PEAK*—Lassen
KETTLEMAN PLAIN[1]—Kings
LOMA PRIETA—Santa Clara
LOMPOC*[2]—Santa Barbara
LONE TREE CREEK—San Joaquin
LONE TREE WELL[1]—Kern
LOS ANGELES—Los Angeles
MERCED FALLS*[1]—Merced
MT. SIZER—Santa Clara
ORESTIMBA PEAK—Stanislaus
PACHECO PASS*—Merced
PALO ALTO*[1]—Santa Cruz
POINT ARGUELLO*[2]—Santa Barbara
PYRAMID HILLS[1]—Kings
SAN FELIPE—Santa Clara
SAWTOOTH RIDGE—Kern
SUSANVILLE*—Lassen
THREE SISTERS—San Benito
TRES PINOS—San Benito
TWENTYNINE PALMS—San Bernardino
WEST CAMP[1]—Kern
WHITEWATER—Riverside

California—Arizona

BIG MARIA MTS. NE—Riverside
BIG MARIA MTS. SE—Riverside
PICACHO SW—Imperial

Colorado

CEBOLLA—Gunnison
ELDER—Otero
LEWIS RANCH—Otero
McINTOSH RANCH—Bent
SAPINERO—Gunnison
STRASBURG—Adams
SUGAR CITY—Crowley
WATKINS—Adams
WILEY—Prowers

Colorado-Kansas

HOLLY NE—Prowers

Connecticut

GUILFORD—New Haven
MOUNT CARMEL—New Haven
NAUGATUCK—New Haven
NEW MILFORD—Litchfield
WALLINGFORD—New Haven

Delaware

BETHANY BEACH—Sussex
CLAYTON—Kent
FAIRMOUNT[1]—Sussex
LEWES[1]—Sussex

Delaware-New Jersey

CAPE HENLOPEN[1]—Sussex

Florida

BAYARD—Duval
BRONSON NE—Levy
BRONSON SE—Levy
CEDAR KEY—Levy
COBB ROCKS—Jefferson
CODY—Jefferson
DAYTONA BEACH—Volusa
DURBIN—St. Johns
EAST PASS—Levy
FLEMING ISLAND—Clay
GREENVILLE—Madison
GREENVILLE SE—Madison
HORSESHOE BEACH—Dixie
KEATON BEACH—Taylor
LAFAYETTE—Leon
LAMONT—Jefferson
LAMONT SE—Jefferson
LEBANON STATION—Levy
MALLORY SWAMP NE—Lafayette
MANLIN HAMMOCK—Taylor
MAYO—Lafayette
MAYO NE—Suwannee
MAYO SE—Suwannee
MICKLER LANDING—St. Johns
NUTALL RISE—Taylor
ORANGEDALE—St. Johns
ORANGE PARK—Clay
PALM VALLEY—St. Johns
PERRY—Taylor
ROCK BLUFF—Liberty
ROCK ISLANDS—Taylor
ST. MARKS—Wakulla
ST. MARKS NE—Wakulla
SAMSULA—Volusia
SEAHORSE KEY—Levy
SHIRED ISLAND—Dixie
SNIPE ISLAND—Taylor
SOUTH PONTE VEDRA BEACH—St. Johns
SPRAGUE ISLAND—Wakulla
STEINHATCHEE—Taylor
STEINHATCHEE SW—Dixie
SUMNER—Levy
SUWANNEE—Dixie
TIDEWATER—Levy
VISTA—Levy
WACCASASSA BAY—Levy
YANKEETOWN—Levy

Florida-Georgia

CHATTAHOOCHEE—Gadsden

Georgia

FAIRBURN—Fulton
MABLETON—Cobb
REYNOLDSVILLE—Seminole
TIGNALL—Wilkes

Georgia-South Carolina

CHENNAULT—Lincoln

Hawaii
HAUULA—Honolulu
HONOLULU—Honolulu
MAALAEA—Maui
MAKENA—Maui
PAIA—Maui
PUU O KALI—Maui
WAIPAHU—Honolulu

Idaho
BOISE SOUTH—Ada
CASCADE*—Adams
COUNCIL*—Adams
GOLD FORK*—Valley
NEW MEADOWS*—Adams
WARM LAKE*—Valley

Idaho-Oregon
OLDS FERRY*—Washington

Illinois
BLUE ISLAND[1]—Cook

Illinois-Indiana
SAINT BERNICE—Vermilion
SANDFORD—Vigo

Illinois-Missouri
THEBES*[1]—Alexander

Indiana
BELLMORE—Parke
CLERMONT—Marion
HUNTINGBURG—Dubois
SAINT ANTHONY—Dubois

Indiana-Kentucky
KOSMOSDALE—Jefferson
LANESVILLE—Harrison

Kansas
NILES—Ottawa

Kentucky
BIRMINGHAM POINT[1]—Marshall
CARRIE—Knott
FAIRDEALING[1]—Marshall
GRAND RIVERS—Livingston
HARLAN—Harlan
MAYKING—Pulaski
NEW CONCORD[1]—Calloway
SOMERSET—Pulaski

Kentucky-Illinois
LITTLE CYPRESS—Marshall

Kentucky-Indiana
OWEN—Clark

Kentucky-Virginia
HELLIER—Pike
JENKINS WEST—Letcher
VARILLA—Bell

Louisiana
GRAND LAKE WEST*[1]—Cameron
ST. MARTINSVILLE*—St. Martin

Maine
CARIBOU*[1]—Aroostook

Maryland
LOWER MARLBORO—Calvert
MECHANICSVILLE—St. Marys

Massachusetts
TEMPLETON[1]—Worcester

Michigan
BIG BAY*—Marquette
HETHERTON*—Montmorency
HURON MOUNTAINS*—Marquette
PERCH LAKE*—Iron
SIDNAW*—Houghton
SKANEE*—Houghton
WINONA*—Houghton

Minnesota
AUSTIN*—Mower
CHATFIELD*—Fillmore
GREENWOOD LAKE*—Lake
HAYWARD*—Freeburn
HOPKINS—Hennepin
SILVER BAY*—Lake

Missouri
CHILHOWEE—Johnson
CORNELIA—Johnson
HAYTI*—Pemiscot
MALDEN*—Dunklin
PASCOLA*—Pemiscot

Missouri-Arkansas
KENNETT*[1]—Dunklin

Montana
BLUE TIMBER—Sweet Grass
CARTER COULEE—Fergus
COUNCIL ISLAND—Chouteau
LANDER CROSSING—Chouteau
LEROY—Blaine
SLIDEROCK MOUNTAIN—Sweet Grass
TAFFY RIDGE—Fergus

Nebraska
AKRON—Boone
ALBION WEST—Boone
ATKINSON NE—Holt
ATKINSON NW—Holt
BARTLETT—Wheeler
BARTLETT NW—Wheeler
BARTLETT SE—Wheeler
BELGRADE—Nance
BELGRADE NW—Nance
CEDAR RAPIDS—Boone
DORSEY SW—Holt
ERICSON—Wheeler
MEEK—Holt
MEEK NE—Holt
NEWPORT—Rock
NEWPORT NE—Rock
NEWPORT SW—Rock
SPALDING—Greeley
SPALDING NW—Greeley
SPALDING SE—Greeley
SPALDING SW—Greeley
STAR—Holt
STUART NE—Holt
STUART NW—Holt
VERDIGRE—Knox
WALNUT—Knox

Nevada
UNIONVILLE*—Pershing

New Hampshire
WINDHAM—Rockingham

New Jersey
CALDWELL[1]—Essex
FARMINGDALE[1]—Monmouth
FLEMINGTON[1]—Hunterdon
HAMBURG[1]—Sussex
LAKEWOOD[1]—Ocean
MARLBORO[1]—Monmouth
MONMOUTH JUNCTION[1]—Middlesex
NEW BRUNSWICK[1]—Middlesex
TRANQUILITY[1]—Sussex

New Jersey-Pennsylvania
CULVERS GAP[1]—Sussex
PENNINGTON[1]—Mercer
STOCKTON[1]—Hunterdon

New Mexico
ARTESIA—Eddy
DAYTON—Eddy
GOMEZ RANCH—Rio Arriba
HACKBERRY RANCH—Chaves
KINCAID RANCH—Chaves
LAKE MCMILLAN NORTH—Eddy
LAKE MCMILLAN SOUTH—Eddy
PINE RIVER—San Juan
SPRING LAKE—Eddy

New York
AMSTERDAM—Montgomery
BURNT HILLS—Saratoga
CALEDONIA*[2]—Livingston
CANISTEO—Steuben
CLARKSVILLE—Albany
ERIN—Chemung
GRAFTON[1]—Rensselaer
HUNTINGTON[1]—Suffolk
IVORY—Chautauqua
JONES INLET—Nassau
LAWRENCE[1]—Nassau
MECHANICSVILLE—Saratoga
MONTEZUMA—Cayuga
RIPLEY—Chautauqua
ROTTERDAM JUNCTION—Schenectady
ROUND LAKE—Saratoga
SCHAGHTICOKE—Rensselaer
SOUTH CANISTEO—Steuben
TOMHANNOCK—Rensselaer
TROUPSBURG—Steuben
TROY NORTH—Albany
VICTORY—Cayuga
WEEDSPORT—Cayuga
WILSON*[2]—Niagara

New York-Pennsylvania
WELLSBURG—Chemung

North Carolina
FAIRFIELD NW—Hyde
FRYING PAN—Tyrrell

North Dakota
BARTON—Pierce
BERWICK—McHenry
CLEVELAND NW—Stutsman
GARDENA—Bottineau
LEVERICH—Pierce
MEDINA—Stutsman
OMEMEE—Bottineau
OVERLY SE—Rolette
ROTH—Bottineau
ROUND LAKE—Pierce
RUGBY NW—Pierce
TOWNER NE—McHenry
TOWNER SE—McHenry
TUNBRIDGE—Pierce
WILLOW CITY—Bottineau

Ohio
CEDARVILLE—Greene
COMMERCIAL POINT—Packaway
GIRARD—Trumbull
HARRISBURG—Franklin

Ohio-Pennsylavnia
SHARON WEST—Mercer

Oklahoma
MINGO—Tulsa
SPERRY—Tulsa

Oregon
AGNESS*—Curry
CANYONVILLE*—Douglas
CAPE FERRELO*—Curry
DAYS CREEK*—Douglas
DIXONVILLE*—Douglas
DRAIN*—Douglas
GOLD BEACH*—Curry
LAKECREEK*—Jackson
MOLALLA—Clackamas
OREGON CITY—Clackamas
PEARSOLL PEAK*—Josephine
REDLAND—Clackamas
SELMA*—Josephine

Pennsylvania
ABBOTTSTOWN—Adams
ASAPH—Tioga
ASHLAND[1]—Schuylkill
CROOKED CREEK—Tioga
DELANO[1]—Schuylkill
GILLETT—Bradford
HUGHESVILLE*[1]—Lycoming
KNOXVILLE—Tioga
MANSFIELD—Tioga

MILLERTON—Tioga
NANTICOKE—Luzerne
PINE GROVE[1]—Schuylkill
TREMONT[1]—Schuylkill
WEST CHESTER—Chester
WILLIAMSPORT*[1]—Lycoming

Pennsylvania-New York

ELKLAND—Tioga
JACKSON SUMMIT—Tioga
SCANDIA—Warren
TIOGA—Tioga

South Dakota

BELLE FOURCHE—Butte
BONEITA SPRINGS—Meade
BRENNAN FLAT—Pennington
CRESTON—Pennington
ELM SPRINGS—Meade
ELM SPRINGS SW—Meade
FRUITDALE—Butte
HAYDRAW—Meade
JEWEL CAVE SE—Custer
JEWEL CAVE SW—Custer
JOLLY—Butte
MIDLAND—Haakon
MIDLAND SE—Haakon
NOWLIN—Haakon
OWANKA—Pennington
POWELL—Haakon
QUINN TABLE—Pennington
SCENIC—Pennington
WASTA SE—Pennington

South Dakota-Minnesota

BIG STONE LAKE*—Big Stone

Tennessee

BELLEVIEW—Davidson
GALLATIN—Sumner
HILHAM—Overton
HUNTERS POINT—Wilson
JUNO—Henderson
LAGUARDO—Wilson
LURAY—Henderson
MONTEREY—Putnam
OKALONA—Overton
SCOTTSBORO—Davidson
VIOLA—Warren
WHITES CREEK—Davidson
WILDER—Fentress
WINDLE—Overton

Tennessee-Kentucky

BARTHELL SW—Scott
ONEIDA NORTH—Scott
PALL MALL—Fentress
SHARP PLACE—Fentress

Texas

ARANSAS PASS—San Patricio
AUSTIN EAST—Travis
AUSTIN WEST—Travis
BRAND—Scurry
ESTES—Aransas
OAK HILL—Travis

Utah

BULL MTN.*—Garfield
‡CARLISLE 3 SE—San Juan
DUGWAY PROVING GROUND NE—Tooele
HALL MESA*—Garfield
LAKE CANYON*—San Juan
MT. ELLSWORTH*—Garfield
‡MT. WAAS 1 SW—Grand
‡MT. WAAS 3 SW—Grand
‡PARIA NW—Kane
‡SPRINGDALE NE—Kane
THE RINCON*—San Juan
THE SPUR*—Wayne
TINTIC JUNCTION—Juab
TINTIC MOUNTAIN—Juab
‡WESTWATER 4 SW—Grand
WHISTLER CANAL—Box Elder
WIG MTN. NW—Tooele
‡WILDCAT MTN. SE—Tooele

Utah-Arizona

GUNSIGHT BUTTE*—Kane
‡KANAB SE—Kane
‡KANAB SW—Kane
NIPPLE BUTTE—Kane
‡PARIA SW—Kane
‡SPRINGDALE SE—Kane
‡SPRINGDALE SW—Washington

Utah-Colorado

‡WESTWATER 4 SE—Grand

Vermont

BENNINGTON—Bennington

Virginia

CLOVER*—Halifax
DEEP CREEK—Norfolk
FENTRESS—Norfolk
HALIFAX*—Halifax
LAKE DRUMMOND NW—Norfolk

Virginia-Maryland

DAHLGREN—King George

Virginia-North Carolina

LAKE DRUMMOND—Norfolk
MOYOCK—Currituck

Washington

BEVERLY*[2]—Grant
BOGACHIEL PEAK—Clallam
CENTRALIA*—Lewis
DEEP CREEK—Spokane
ELMA*—Grays Harbor
LOOKOUT MTN.*—Skamania
MEDICAL LAKE—Spokane
MOUNT CARRIE—Clallam
ONALASKA*—Lewis
ORCHARDS—Clark
OTHELLO—Adams
SHELTON*[1]—Mason
SLIDE PEAK—Clallam
SODA LAKE—Grant
SPANGLE*—Spokane
WARDEN—Grant

Washington-Idaho

FAIRFIELD*—Spokane

Wisconsin

CHILTON*—Calumet
DE PERE—Brown
GRANTON*—Clark
HOWARDS GROVE*[2]—Sheboygan
KEWAUNEE*—Kewaunee
KIEL*—Manitowoc
MARSHFIELD*—Wood
SHEBOYGAN FALLS—Sheboygan
SHEBOYGAN FALLS*—Sheboygan
SHEBOYGAN SOUTH—Sheboygan
SHEBOYGAN SOUTH*—Sheboygan

Wyoming

BEAVER CREEK—Carbon
LINCH—Johnson
TAYLOR RANCH—Campbell

In addition to the standard series of quadrangle maps, small-scale (1:250,000) maps of areas in the United States and Territories are being published and distributed. Some of these maps are published in a shaded-relief edition, as indicated in the list below. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Alaska

BLYING SOUND†
NOME†
SHISHMAREF†
SOLOMON†

Illinois-Indiana

DANVILLE

North Dakota

DEVILS LAKE
NEW ROCKFORD

North Dakota-Minnesota

FARGO
GRAND FORKS

South Dakota-North Dakota

ABERDEEN

Special metropolitan-area and vicinity maps of major United States cities are being published and distributed by the Geological Survey. These maps are prepared from standard 7½-minute maps at the scale of 1:24,000. Vicinity maps may be purchased from the Geological Survey for the prices indicated below. Those published between March 1 and May 31, 1956 are:

BRIDGEPORT AND VICINITY (30 by 50 inches) $1.00
DULUTH, SUPERIOR AND VICINITY (36 by 54 inches) $1.50
HARTFORD, NEW BRITAIN AND VICINITY (47 by 53 inches) $1.50
KNOXVILLE AND VICINITY (28 by 33 inches) $1.00
ROCHESTER AND VICINITY (46 by 55 inches) $1.50
YOUNGSTOWN AND VICINITY (44 by 38 inches) $1.50

Lake Survey Charts

PUBLICATION of new editions of the following Lake Survey Charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Building, Detroit 26, Mich., at 75 cents per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States.

3.—Lake Erie. General chart of the entire lake, at 1 : 400,000 scale. (March 1956.)
5.—Lake Huron. General chart of the entire lake, at 1 : 500,000 scale. (March 1956.)
15.—St. Lawrence River. Brockville, Ont., to Deer Island, at 1 : 30,000 scale. (March 1956.)
16.—St. Lawrence River. Deer Island to Bartlett Point Light, at 1 : 30 000 scale. Insets: Clayton, N. Y., and Alexandria Bay, N. Y., at 1 : 10,000 scale. (March 1956.)
17.—St. Lawrence River. Bartlett Point Light, N. Y., and St. Lawrence Island, Ont., to Cape Vincent, N. Y., and Cold Bath Shoal, Ont, at 1 : 30,000 scale. Inset: Cape Vincent, N. Y., at 1 : 10,000 scale. (April 1956.)
18.—St. Lawrence River. Cape Vincent, N. Y., and Howe Island, Ont., to Alian Otty Shoal, N. Y., and Ninemile Point Light, Ont., at 1 : 30,000 scale. (May 1956.)
23.—Eight miles east of Sodus Bay, N. Y., to Rochester Harbor, N. Y., at 1 : 80,000 scale. (April 1956.)
24.—Braddock Point, N. Y., to Thirty Mile Point, N. Y., at 1 : 80,000 scale. (February 1956.)
32.—Sturgeon Point, N. Y., to 13 miles east of Erie, Pa., at 1 : 80,000 scale. Inset: Dunkirk Harbor, N. Y., at 1 : 15,000 scale. (March 1956.)
34.—Eight miles east of Ashtabula, Ohio, to 15 miles west of Fairport, Ohio, at 1 : 80,000 scale. Inset: Mentor Harbor, Ohio, at 1 : 10,000 scale. (April 1956.)
35.—Twelve miles east of Cleveland, Ohio, to Vermilion, Ohio, at 1 : 80,000 scale. Insets: Vermilion, Ohio, and Rocky River, Ohio, at 1 : 10,000 scale. (March 1956.)
116.—St. Lawrence River, Gananoque, Ont., to St. Lawrence Park, N. Y., at 1 : 15,000 scale. (May 1956.)
332.—Erie Harbor and Presque Isle, Pa., at 1 : 15,000 scale. (March 1956.)
354.—Cleveland Harbor, Ohio, including lower Cuyahoga River, at 1 : 10,000 scale. (February 1956.)
357.—Loraine Harbor, Ohio, at 1 :10,000 scale. (February 1956.)
374.—Toledo Harbor, Ohio, Lower Maumee River, Maumee Bay and Ottawa River at 1 : 20,000 scale. Inset: Entrance Channel to harbor at 1 : 40,000 scale. NOTE: The area covered by this chart has been extended to show the approach to and the mouth of the Ottawa River. (March 1956.)

Public Land Survey Plats

THE FOLLOWING plats of public land surveys and resurveys were completed and accepted by the Bureau of Land Management between March 1 and May 31, 1956. The class or purpose of the survey is indicated. Copies of plats may be secured from the Bureau Offices in the States or from the Director, Bureau of Land Management, Department of the Interior, Washington 25, D. C.

Alaska

Saxman Townsite—U. S. Survey 1652A.
Ketchikan Pulp Company—U. S. Survey 3400
Ketchikan Pulp Company—U. S. Survey 3401
Wrangell Small Tracts—U. S. Survey 3402
Mienilchik Mine—U. S. Survey 3407

Alaska—Seward Meridian

T. 17 N., R. 2 E.—segregation survey
T. 26 N., R. 5 W.—dependent resurvey
T. 8 S., R. 14 W.—resurvey and survey

California—San Bernardino Meridian

T. 17 N., R. 6 E.—skeleton survey
T. 17 N., R. 7 E.—skeleton survey
T. 17 N., R. 8 E.—skeleton survey

Colorado—6th Principal Meridian

T. 5 N., R. 73 W.—resurvey and subdivision of sections

Idaho—Boise Meridian

T. 8 N., R. 21 E.—dependent resurvey
T. 8 N., R. 22 E.—dependent resurvey
T. 8 N., R. 23 E.—dependent resurvey
T. 3 N., R. 25 E.—dependent resurvey
T. 3 N., R. 26 E.—dependent resurvey
T. 14 S., R. 29 E.—dependent resurvey
T. 15 S., R. 29 E.—dependent resurvey
T. 16 S., R. 29 E.—dependent resurvey
T. 14 S., R. 30 E.—dependent resurvey
T. 16 S., R. 30 E.—dependent resurvey
T. 15 S., R. 45 E.—dependent resurvey

Michigan—Michigan Meridian

T. 2 N., R. 10 W.—island survey
T. 4 S., R. 1 E.—resurvey subdivision of section

Minnesota—5th Principal Meridian

T. 148 N., Rs. 32 and 33 W.—resurvey and extension survey

Montana—Principal Meridian

T. 12 N., R. 34 E.—dependent resurvey
T. 13 N., R. 34 E.—dependent resurvey
T. 11 N., R. 35 E.—dependent resurvey
T. 12 N., R. 35 E.—dependent resurvey
T. 13 N., R. 35 E.—dependent resurvey
T. 12 N., R. 36 E.—dependent resurvey

Nevada—Mt. Diablo Meridian

T. 43 N., R. 36 E.—dependent resurvey
T. 41 N., R. 37 E.—dependent resurvey
T. 42 N., R. 37 E.—dependent resurvey
T. 16 N., R. 59 E.—dependent resurvey
T. 17 N., R. 59 E.—dependent resurvey
T. 18 N., R. 60 E.—dependent resurvey and survey
T. 20 N., R. 64 E.—dependent resurvey
T. 17 N., R. 65 E.—dependent resurvey
T. 18 N., R. 65 E.—dependent resurvey
T. 19 N., R. 65 E.—dependent resurvey

New Mexico—New Mexico Principal Meridian

T. 26 N., R. 7 W.—dependent resurvey
T. 25 N., R. 8 W.—dependent resurvey

Oregon—Willamette Meridian

T. 32 S., R. 1 W.—dependent resurvey

Utah-Salt Lake Meridian

T. 34 S., R. 13 E.—skeleton survey
T. 34 S., R. 14 E.—skeleton survey
T. 30 S., R. 15 E.—skeleton survey
T. 25 S., R. 17 E.—skeleton survey
T. 26 S., R. 17 E.—skeleton survey
T. 27 S., R. 17 E.—skeleton survey
T. 30 S., R. 17 E.—skeleton survey
T. 28½ S., R. 18 E.—skeleton survey
T. 29 S., R. 18 E.—skeleton survey

Washington—Willamette Meridian

Exchange Survey No. 282—(T. 39 N., R. 36 E.)

Comment and Discussion

The pages of SURVEYING AND MAPPING are open to a free and temperate discussion of all matters pertaining to the interests of the CONGRESS. It is the purpose of this Department to encourage comments and published material or the presentation of new ideas in an informal way.
—EDITOR

LAND SURVEYING DEFINED

VICTOR H. GHENT*—Members of ACSM will be interested in reading the following definition which is reprinted, along with accompanying material, from the Proceedings of the 34th Annual Meeting of the National Council of State Boards of Engineering Examiners.

LAND SURVEYING DEFINED

The term Land Surveying shall mean the performance or practice of any professional service requiring education, training and experience in the application of special knowledge in the mathematical, physical and technical arts and sciences to such professional services as the establishment or relocation of land boundaries, the subdivision of land, the determination of land areas, the accurate and legal description of land areas and the platting of land subdivisions for record.

Land Surveying is closely associated with the daily lives and activities of people, of business and of industry. It is an important science and art. Those who do it correctly and effectively must possess a large amount of technical knowledge, judicious judgment, the ability to investigate with discrimination and to think logically. Although the Land Surveyor does not have final authority he is often called upon to act as judge and jury in collecting evidence, hearing testimony, interpreting the law and in making decisions. A large portion of these abilities and skills must be gained through actual experience, which should include the gathering of evidence in many situations, followed by practice in its interpretation and evaluation. Also, he must know the original land surveying procedures and subsequent rules and regulations of the General Land Office; also, the Federal and State statutes and court decisions on that subject because these are, oftentimes, the guides that control his decisions.

In addition to this knowledge of law and precedent, the Land Surveyor must have an effective working knowledge of the use of surveying instruments and the necessary manual skill that will enable him to do a professional job of land surveying.

It is generally accepted that as land increases in value the details of the procedures governing boundary retracement and the actual field measurements assume increasing importance. Furthermore, specific evidence of the exsitence of the marks of the original surveyors has disappeared in many parts of our country. Along with this, we have very few land surveyors living and in practice who have first-hand, or close, knowledge of the original practices. The task of educating and training a qualified land surveyor is harder than it was a generation ago. Engineering colleges have deleted from their curricula all or most of the material that related to land surveying, and there are very few qualified land surveyors who can, or will, take the time to teach apprentices.

Land surveying as considered here is different from the surveying that is taught in colleges and practiced by engineers generally. The determining difference lies in the fact that land surveying involves the determination of property lines. It comprises all or any combination of the following practices.

(a) The making of such observations and measurements as will determine the relative positions of points, areas, structures or natural objects on the earth's surface, or related thereto.

(b) The surveying of areas:
  (1) For their correct determination and description and for conveyancing,
  (2) For the establishment or re-establishment of land boundaries,

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(3) For the platting of lands and subdivisions, and

(4) For the setting of reference or other monuments to perpetuate such observations, measurements and surveys.

(c) The preparation of land descriptions used in conveyancing.

The qualifications needed by a land surveyor, both in education and in experience, are of such an order that it seems desirable to require that the prerequisite for registration as a land surveyor should equal that for registration as a professional engineer, namely, eight years of combined education and experience as recommended by the Model Law, and the passing of a suitable examination. In the many cases that will arise where a registered professional engineer seeks registration as a land surveyor there should be clear evidence of his qualifying experience in land surveying and the passing of a suitable examination.

QUALIFYING EXAMINATION

Part 1. Basic Science, Mathematics and Surveying.

Time: Two periods of four hours each.

Equipment: Slide rule only for the first four hours; reference of any type permitted for the second four hours.

Questions: To be selected from the listed subjects:

Trigonometry: Relation between the sides and angles of a triangle, heights and distances. Solution of right-angled triangles, sine law, cosine law, tangent law, solution of oblique triangles.

Analytic Geometry: Use of rectangular and polar coordinates. Properties of the circle and spiral.

Algebra: Simple and simultaneous equations; extraction of roots; ratio and proportion; logarithms; elementary theory of probability and least squares.

Physics: Expansion and contraction of solids with changes of temperature; Hooke's law; reflection and refraction of light; properties of lenses.

Surveying (plane): Theory of measurements; measurement of distances; measurement of angles and directions; traversing (latitudes and departures, location of points and lines); referencing points; note taking; stadia for distance measurement; use of coordinates; traverse plotting and making linear maps; measurements and calculations for area; uses and adjustments of surveying instruments.

Part 2. Practice of Land Surveying.

Time: Two periods of four hours each.

Equipment: References and handbooks as required.

Questions: To be selected from listed subjects:

Surveying (area); Area calculation and property subdivision.

Surveying (land): Property description (metes and bounds, rectangular system); writing descriptions; U. S. Public Lands system of surveys; original instructions governing surveys in specific areas; rules of General Land Office for restoration of lost or obliterated corners, for subdivision of sections, for retracement of boundary lines; principle of excess and deficiency; subdivision platting; relative importance of conflicting elements; problems of boundary retracement, property subdivision, and area calculation.

Law: Riparian rights, accretion, adverse possession, easement, harmonizing calls, meaning of wordings in deeds and descriptions, dedication, liability of surveyors; State and Federal statutes; decisions of State supreme courts.

CONFERENCE OF THE BRITISH COMMONWEALTH AND UNITED STATES SURVEYING AUTHORITIES

VICTOR H. GHENT*—Attention is called to this conference, which was held at Wellington, New Zealand, in November 1955, mainly because it was a conference of the English-speaking countries of the world and represented fairly the thinking of those countries.

Prior to this conference a questionnaire was sent out, the answers to which were expected to provide the maximum possible preliminary information bearing on the matters to be discussed later in the conference. The answers to this questionnaire were received, carefully correlated, and redistributed. In September 1950, a proposed conference agenda and final program were sent to all agencies. Committees were formed to evaluate the questionnaires and report on the various phases thereof.

Quoting from the first session of this conference:

Regarding the definition of the surveyor and his rights and duties. It was most important to be simple and clear, and sufficiently comprehensible to avoid later difficulties. The term "sur-

* Secretary, Property Surveys Division, ACSM, Box 937, Route 2, Annandale, Va.

veyor" as defined in the dictionary covers a great deal that is of no use for our purpose. The answers supplied to the questionnaire supplied before the conference also ranged pretty far and wide, but it seemed that the term "land surveyor" was a fair approximation to most of the definitions submitted. As regards the function of the surveyor, the questionnaire answers supplied a comprehensive array. The Committee then broke the functions listed into various groups, as follows:

1. *Land boundary surveys;* to include town planning, development surveys, mine surveys, and land valuation.

2. *Geodetic surveys;* to include triangulation surveys, topographical surveys, and precise leveling.

3. *Topographical surveys;* to include triangulation surveys, precise leveling, and aerial surveys.

4. *Hydrographic surveys;* to include triangulation surveys. (The Committee was not sure of the application of the term "engineering surveys.")

The conference adopted the following—That the most suitable definition of "land surveyor" is: One who measures and delineates naturals and artificials of the earth.

The conference still further decided that a land surveyor may be, and often is, called up to perform a number of important functions which, although they do not fall within the definition of land surveying as stated above, are nevertheless considered within his country part of profession of the survey, and which within his country a land surveyor may properly be called upon to perform.

The conference further stated, in conclusion, that the functions of the land surveyor, as defined above, can generally be comprehended under the following main categories:

A. Basic control and geodetic surveys, including astronomical, gravitational, trigonometrical, height, and electronic measurements.

B. Topographic surveys, include instrumental, graphical and air photographic measurements.

C. Large scale detail surveys including instrumental, optical, graphical and chain measurements.

D. Cadastral surveys, including an establishment of boundaries.

F. Hydrographic surveys.

Some of the functions which he could be called upon to perform included geophysical and geographical surveys; location and layout of structural and engineering works, including mines; practice of measuring and estimating artificial works; the practice of managing and developing estates; determining the value of all descriptions of land, mineral, agricultural and house properties, and the various interest therein; and determining the uses and potentials of land and natural resources.

The conference also determined that surveying subjects of which land surveyors should have a basic academic knowledge before undertaking responsible independent practice, should comprehend the following:

Practical mathematics in land surveying; astronomy; geodesy; engineering surveying; mapping; clear use and adjustment of surveying instruments; laws and regulations affecting surveys; field surveying practices, including plans of survey; and additional subjects such as planning, utilization, valuation of land, and other allied subjects, to be left to the discretion of the country concerned.

VIRGINIA ASSOCIATION OF SURVEYORS PRESENTS BRIEF

The Chairman of the Property Surveys Division, Gordon E. Ainsworth, and its Secretary, Victor H. Ghent, submitted a copy of the following Brief to the Publications Committee with the suggestion that it be published in SURVEYING AND MAPPING. Inasmuch as similar situations exist in many of the States, the Brief is published in full for study and reference by the membership of ACSM.

VIRGINIA:

BEFORE THE STATE BOARD FOR THE EXAMINATION AND CERTIFICATION OF ARCHITECTS, PROFESSIONAL ENGINEERS AND LAND SURVEYORS

IN RE: Subdivision Plats under Fairfax County Subdivision Control Law

I PRELIMINARY STATEMENT

This memorandum is submitted by the Virginia Association of Surveyors.

From a functional viewpoint, this matter involves a very narrow area, yet this Board's action will have a far-reaching impact on the profession of land surveying, not only in Fairfax County, but throughout the Commonwealth and the nation.

II THE QUESTION

The question before this Board arises under the Subdivision Control Ordinance of Fairfax County,[1] which was enacted in 1947 under the enabling authority of the Virginia Subdivision Control Law.[2]

[1] Chapter 5, Fairfax County Code, 1954

[2] Chapter 379, Acts of Assembly, 1946

This enabling act permits the County to enact regulations which require monuments of specific type establishing street and property lines to be erected, and provides that such regulations "may include requirements as to the extent to which and the manner in which streets shall be graded, graveled, or otherwise improved, and water, sewer and other utility mains, piping connections or other facilities shall be installed." The enabling act permits the County to require the submission of a plat showing the above features as a condition precedent to its approval, and then provides that "every such plat shall be prepared by a surveyor or civil engineer duly licensed by the Commonwealth of Virginia. . . ."

The Fairfax County ordinance employs this legislative permission and does require the submission of plats of all proposed subdivisions and specifies what such plats must show. The ordinance provides that the required plats shall be prepared by a "surveyor or engineer duly authorized by the State to prepare such plans and specifications." This requirement, of course, relates to the similar provision in the state enabling act. It cannot in any way broaden or narrow the requirement of the state act.

Since the enactment of the Fairfax County ordinance in 1947, the cognizant county authorities have accepted and approved such plats prepared and certified either by licensed land surveyors or licensed engineers. Of course, improperly prepared plats were rejected, whether submitted by surveyors or engineers, and we hasten to point out here that this question does not involve quality of work. No one can complain of the rejection of poor work, be he engineer or surveyor.

Many surveyors have built up a considerable clientele of builders and developers and a great portion of the practice of these men involves the subdivision of land under the requirements of subdivision control ordinances.

By this long usage and custom, there has been established in several areas a practice of these surveyors preparing and certifying plats showing street profiles and storm drainage features. Sanitary improvements and other improvement designs have been done solely by engineers.

In December, 1955, the Director of Public Works of Fairfax County decreed that henceforth plats containing "engineering features," such as "preparing street designs and storm water drainage" would not be accepted on the certification of a land surveyor.

Because of the drastic effect of this action on the established means of livelihood of its members, The Virginia Association of Surveyors has authorized its cognizant committee to present this matter to this Board for its consideration.

III BASIS FOR REGULATION

As the esteemed President of this Board, Mr. G. Hubard Massey, pointed out in a talk delivered at a recent Refresher Course for Land Surveyors, land surveying is a profession that has existed since antiquity.

Yet, like its allied profession of civil engineering, it has known tremendous growth and change in the past thirty to forty years.

That the growth and increasing identity with the public interest of the engineering profession is recent is clearly illustrated when it is recalled that the first engineering registration statute was enacted in 1907 and that not all of the states had such statutes until 1950. The development of the profession of surveying has followed this pattern. The responsibility and the scope of the surveyor's function have necessarily broadened to keep pace with the relatively modern trend in subdivision control, zoning, and other manifestations of the police power which were unthought of fifty years ago. The superimposing of the requirements of the Federal Housing Administration and Veterans Administration likewise has greatly changed the concept of subdivision layout work.

As recently as 1927 the Illinois Supreme Court in the case of Doe v. Jones[3] held unconstitutional an act which required surveyors to obtain certificates before engaging in the private practice of surveying, holding that no elements of public safety or welfare were involved which would justify the licensing requirement under the police power. Certainly, today no one can question the proposition that the practice of the profession of surveying does affect the public safety and welfare. The fact that thirty-five states, Puerto Rico, Alaska and Hawaii now have surveyors' registration laws demonstrates this proposition.

Just one example will suffice to illustrate the changing nature of the surveyor's role in the orderly development of our physical resources. Under the definition of land surveying in the Virginia registration law, a surveyor clearly can make a survey for "the subdivision of land." Thirty years ago subdividing land involved nothing more than the laying out of a grid. Many subdivisions exist today where the drain-

[3] Doe v. Jones, 327 Illinois 387, 158 N.E. 703, 55 ALR 303.

age problems clearly demonstrate that no consideration was given to them at the time the subdivision was laid out. Now, the entire concept of subdivision land requires paramount consideration to be given to drainage problems. Street layout is dictated by overall planning and development considerations, as applied by local authorities and Federal Housing Administration and Veterans Administration requirements. *A subdivision cannot be properly laid out without street design and storm drainage being considered as integral and inseparable parts thereof.*

Administrative determinations as well as judicial pronouncements must be made with a view toward current development. The law as interpreted by the courts is not static but it is viewed by the courts in the light of *present day* conditions and practical considerations. Administrative bodies in the exercise of their sound discretion should consider their decisions in the same light.

It seems obvious that "subdividing land" means something entirely different today than it did twenty years ago. Should not this Board, in determining a present day definition of "subdividing land" look at present day practice and present day circumstances and present day needs, rather than merely consider those of twenty years ago?

If these intrinsic changes are to be ignored, if the modern surveyor is to be limited to the scope of the ancient practice, are we not eliminating the need for regulation of the profession in the first place? We would soon be within the outmoded rule of Doe v. Jones and there would be no valid subject of regulation.

The surveyor does not want this result. The surveyor wants his profession to be regulated; he appreciates the protection afforded him by a licensing statute; he wants to increase the stature of his profession. That is why he urges this Board to apply modern standards to an ancient definition.

IV SCOPE OF THE QUESTION

The surveyor is not asking this Board to grant him a professional engineer's license without his being qualified for it. He is not asking that he be permitted to practice engineering. The only area in question is street profile and storm drainage work which is an integral part of the subdivision of land. A subdivision which is designed without a thorough appreciation and application of these considerations is a waste of the surveyor's time and the client's money. If the surveyor *cannot* by this Board's order, include these considerations, then he *cannot* properly subdivide land.

It is difficult to say whether these two functions encroach upon the field of engineering at all, since the Virginia registration statute does not define engineering, and since the surveyor is expressly authorized by the statute to subdivide land. However, for the sake of argument, grant that these two functions are "engineering" in nature. How large is the "area of encroachment," and is such "encroachment" derogatory to the public health, welfare and safety?

First, the width and depth of any cut into the engineering sphere is minor indeed. For example, through the promulgation of design standards, Fairfax County has done the engineering involved in street design and storm drainage incident to subdivisions in that county.

Under Fairfax County's requirements, plans for the following improvements must accompany the subdivision plat for a suburban residence zone (12,500 square feet average lot size):

(1) A typical street section
(2) A typical driveway entrance
(3) A typical curb and gutter section
(4) A typical headwall, if any
(5) A typical storm sewer manhole, if any
(6) A typical curb inlet, if any
(7) A typical yard drain, if any
(8) Location of drainage structures, storm sewer pipes and pipe sizes
(9) Street grades with length and elevations along vertical curves, and elevations at station and half stations along vertical tangents

Items (1) through (7) are designed and prescribed by the County.[4] No design is involved in the preparation of the plat.

In Item (8), the standards prescribe the location of drainage structures. All that remains for determination is the pipe size and this is largely predetermined by the practice of the County in applying a standard Q factor for subdivisions in each zone. For example, it is well known that for a suburban residence zone (12,500 square feet average lot size) Fairfax County has accepted as a standard the factor $Q = 2.5$ cubic feet per second per acre. The coefficient of roughness is predetermined. The rate of grade can be mechanically determined. Obviously, the only thing left to the determination of the subdivider is the size of the watershed and unquestionably a surveyor is permitted

[4] County of Fairfax, Virginia, Planning Commission, Storm Sewer Appurtenances and Street Construction Standards, with addenda thereto.

to determine this. Using these factors, and by use of nomographs, the pipe size can thus be determined by purely mechanical means.

As for Item (9) above, the Fairfax County Standards prescribe the design of streets in detail, including safe sight distances on vertical curves.

It is interesting to note that in the Refresher Course for Surveyors given at the Virginia Military Institute in January 1954, ten hours of the course were devoted to the Theory of Curves, including Vertical curves.

Many of the surveyors affected by this question were examined by the Virginia Board on highway vertical and horizontal alignment in qualifying for their Virginia licenses.

With practically all of the engineering phases of the possible encroachment area already accomplished and prescribed by the County, is the surveyor really practicing engineering when he applies these criteria as an integral part of his authorized function of subdividing land, when he uses these criteria as a basis for his subdivision of land and when he cannot properly subdivide land without using them?

The area of possible encroachment is narrow even before it is rendered almost nonexistent by these predetermined standards. Although curricula variations among Engineering Schools make generalization impossible, it is interesting to note that the area here involved was covered by one school in five hours of a four-year course in Civil Engineering.

An examination of representative texts in the two specific functions in question is enlightening. The calculation of pipe sizes takes up five pages out of the 597 pages of the textbook Sewerage and Sewerage Treatment, by Harold E. Babbitt. Street grade calculation, including safe sight distance for vertical curves, is covered in five pages of the 634-page textbook Highway Design and Construction, by Arthur G. Bruce.

It is axiomatic that the constitutional basis upon which all occupational registration laws are founded is the relation of the regulated occupation to the public welfare and safety. In view of all of the prescribed standards, can it be said that the actual encroachment by the surveyor in including street design and storm drainage features which are required in a subdivision plat is harmful to the public health welfare and safety?

The Virginia registration law grants a total exemption from the licensing requirement to employees of the state or any political subdivision thereof. It seems that the public welfare and safety would be placed much more in jeopardy through this exemption than by the minute area of possible encroachment in the matter now before this Board. Of course, it is realized that this exemption is authorized by the statute and that the Board is bound thereby. However, this exemption demonstrates that if the legislature felt that the public health safety and welfare would not be adversely affected by governmental employees practicing the entire field of engineering without any license of any kind, it would not be unreasonable for this Board to determine that the inclusion of street profiles and storm drainage features in their subdivision plats by licensed and qualified surveyors is not derogatory to that same public health safety, and welfare.

V PROBLEM OF OVERLAPPING

If the current practice of surveyors in the functional area in question results in an overlapping of the practices of surveyors and engineers, such a situation is by no means novel. Provisions permitting various types of overlapping are found in thirty-two engineering registration statutes. These provisions usually take the form of exemptions from the application of the registration statute.

For example, fifteen State engineering registration laws permit architects to do engineering work incidental to their work.[5] Eleven registration statutes are not applicable to practitioners of other duly recognized professions;[6] two states permit registered engineers to practice surveying without a surveyor's license;[7] and two states exempt surveyors from engineering license requirements.[8]

The Virginia Registration Law contains conspicuous exemptions in favor of architects and engineers—conspicuous because of the lack of a corresponding exemption in favor of surveyors:

"The following shall be exempted from the provisions of this chapter:

(1) Practice of professional engineering and land surveying by a certified architect when such practice is incidental to what may be properly considered an architectural undertaking.

(2) Practice of architecture and land surveying by a certified professional engineer when

[5] Calif., Del., D. C., Ill., Ind., Kans., Ky., La., N. H., N. Y., N. C., Ore., Pa., Vt., Va.

[6] Del., D. C., Idaho, La., Md., Mont., N. H., N. C., R. I., S. C., Wash.

[7] N. C., N. Y.

[8] Ind., Miss.

such practice is incidental to an engineering project."[9]

The omission of a corresponding provision in favor of surveyors reflects the growth in stature and scope of the surveying profession since the enactment of this statute in 1924. At that time, before the application of planning and control concepts to the platting of subdivisions, the legislature was probably justified in considering that the surveyor's work did not warrant the granting of a similar exemption to him. Now, however, it is obvious that this concept is outdated.

The statute clearly shows that some overlapping among the professions is anticipated and that overlapping is not considered detrimental per se.

If there really is overlapping in the matter now before this Board, the members of the two professions involved, engineering and land surveying, seem agreed that it is not harmful. No case is known of a complaint by an engineer that a surveyor, merely because of his performing the functions in question, is practicing engineering without a license. Nor has any such surveyor been prosecuted for violating the registration law.

Mr. Alfred L. McCauley, Counsel for the Missouri State Board of Registration for Architects and Professional Engineers, who is a recognized authority in the field of professional registration laws, points out:

"Professional engineers, like lawyers, physicians, certified accountants and other recognized professions have overlapping practice problems from more angles than one. Attempts to settle these questions by statutory enactment or in court action have been mainly futile. The proposition can best be handled by the individuals concerned in every case of overlapping professional practice."[10]

So far as is known, such overlapping as may be involved in the matter before this Board has not resulted in any disharmony between the engineers and surveyors. Had the engineers been in any way hurt by the practice, they would have made this known loud and clear long before this time. The question is not brought to the Board now through the complaint of a privately practicing engineer, and he is the one who would feel the direct effect of the unauthorized practice of engineering.

This matter is parallel to the situation that exists between lawyers and real estate brokers. The preparation of contracts and leases is clearly a part of the practice of law, yet a real estate broker is permitted to fill in blanks in forms of contracts and leases previously drawn by lawyers. Usually, the part "filled in" by the real estate broker contains the most significant parts of the contract or lease, and often the "filled in" part greatly outweighs the prepared part not only in significance but in volume, so that in reality, the contract or lease is drawn by the real estate broker. However, since an essential part of the real estate broker's profession is to prepare such documents and since he would be seriously handicapped in the practice of his profession as it has developed over the course of the years, if this function were suddenly denied him, the legal profession does not consider the situation a serious overlapping at all. It is lived with very nicely by both professions. This does not mean that the lawyer would not be wrathful if the real estate broker went too far in the area of overlapping. What is "too far" is determined largely by custom and usage which has grown up through the necessities of the real estate broker's work. Let real estate brokers start drawing deeds and all manner of protests would arise from the lawyers, yet it is just as much a legal function to draw contracts and leases as it is to draw deeds. The conveniences and necessities of the practice of each profession dictate the permissive areas of overlapping.

Overlapping between professions is regulated to a great extent by the ethics of each profession. Every professional man has ethical standards which prohibit him from undertaking functions for which he is not qualified. There may be exceptions to the rule. If so, the public interest is protected by the license revocation provisions of the Virginia Registration Statute.

It is absolutely necessary for a modern surveyor operating under a modern subdivision control law to apply street design and storm drainage considerations. He cannot properly lay out a subdivision without these considerations playing a paramount role. The practice of the real estate broker's drawing of contracts and leases is striking in its similarity.

VI EXISTING CONCEPT OF "SURVEYING"

It is realized that this Board cannot legislate. The Board is not being asked to legislate. The present statute clearly permits a surveyor to make surveys "for the subdivision of land and such topographic work as may be incident

[9] Sect. 54–37 (1) and (2), Code of Virginia, 1950

[10] Professional Engineering Laws, a Compendium, Alfred L. McCawley, p. 543

thereto." The Board merely is being asked to determine that the functions in question are an integral part of the subdivision of land and that accordingly the performance of them under presently existing conditions is within the purview of this statutory definition of the surveyor's function.

To determine this would not be a departure from existing concepts of the profession of surveying.

The neighboring State of Maryland, by legislative enactment, has recognized this precise point in defining surveying in its registration law:

"The 'practice of land surveying' within the meaning and intent of this Article includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof. The plotting of lands and subdivisions may include topography and contours, setting grades and determining drainage of streets and roads, and providing for small drainage structures."[11]

A surveyor licensed in Virginia may obtain registration in Maryland without examination. It would be strange indeed if a surveyor licensed in both Maryland and Virginia on the basis of his Virginia qualification, could not perform the functions in question in Virginia when he unquestionably can do so in Maryland.

The Delaware registration law includes "grades for buildings, ditches, roads, sewers, etc. . . ." in its definition of the practice of land surveying. The great majority of state registration laws include "subdivision of land" in their definitions of the practice of land surveying.

New Jersey's registration statute is similar to that of Virginia, and in the administration of the statute, street profiles and storm drainage work are considered within the surveying function. The professional engineers of New Jersey themselves recognize these functions as "surveying services." The following items appear in the recommended fee schedule for "land surveying practice" promulgated by the New Jersey Society of Professional Engineers in 1956 in the Manual of Professional Land Surveying Practice:

"M. Subdivisions and Group Surveys

* * * * *

"4. Preliminary Plat

Exhibits and presentations in accordance with preliminary plat requirements of the State of New Jersey and Local ordinances.

"5. Final Plat

Exhibits and presentations in accordance with final plat requirements of the State of New Jersey and Local ordinances.

"6. Centerline stakes and grade, plus field collection of data required for the design of the roads and utilities—field work only.

"7. Preparation of plans and final road, drainage and utilities, based on data secured in M-6 above.

a. Preparation of plans and specifications of final roads, drainage and utilities, based on data secured in M-6 above.

b. Preparation of plans and specifications and final inspection of roads, drainage and utilities, based on data secured in M-6 above."

[11] Maryland P.L., Chap. 752, Sect. 1, para 2(e) and (f).

VII CONCLUSION

In view of the above considerations, the Board is respectfully, but earnestly, asked to examine the function of the modern surveyor under modern subdivision control laws and under the subdivision requirements of the Federal loan guarantee agencies.

It is submitted that in his clearly authorized function of subdividing land, the surveyor must take into account and determine the two matters in question, street design and storm drainage. If he does not, he is remiss in his duties to the public. If he is not permitted to include these requirements in his plats of subdivisions, then, since each properly drawn subdivision plat *must* include these features, he is *prohibited* from subdividing land. This result certainly is not the intent of the legislature, nor we submit, is it the proper result of this Board's determination.

Paramount consideration of the public health, welfare and safety are the only justifications for depriving a professional man of the right to pursue his profession. Over the course of years, licensed surveyors of Fairfax County, Arlington County, the City of Alexandria, and the City of Richmond have designed and platted subdivisions showing street and drainage features. Their plats have been accepted and approved by the authorities of these jurisdictions. In each of these jurisdictions many subdivisions now exist which were approved on these surveyors' plats. These surveyors, with the complete sanction of the local authorities and the engineering profession have built up their means of livelihood through their subdivision work.

What change has taken place which would result in their work in this regard now being

adverse to the public welfare and safety when it has not been in all the years up until the present time?

This Board is urged to find that, under present day conditions and in the light of the above considerations, the authority of a licensed surveyor to subdivide land carries with it as an indispensable part thereof, the authority to include such street and drainage features as are necessary to the subdivision of land.

Respectfully submitted,

SPECIAL LEGISLATIVE AND ADVISORY COMMITTEE

VIRGINIA ASSOCIATION OF SURVEYORS

WOOD, BAUKNIGHT & TESTERMAN

Ford Building
Fairfax, Va.
Counsel

MAP OF MOSCOW GOES ON SALE

W. S. DIX*—An Associated Press item, bearing the dateline "MOSCOW, August 18, 1956" indicates the Russian bookstores in Moscow are displaying for sale for the first time since before World War II a map of the capital city, showing main roads, railways stations, monuments, the subway system, and the Kremlin.

* Executive Secretary, ACSM.

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Experimental Testing of Wave Equations

Experimental testing of wave equations is the subject of a recent Quarterly of the Colorado School of Mines titled "Seismic Wave Propagation and Pressure Measurements Near Explosions" by George R. Pickett, exploitation engineer with the Shell Oil Company.

This Quarterly is a condensation of the data obtained and interpreted by Dr. Pickett for his dissertation in the Geophysics Department of the Colorado School of Mines.

The author derives displacement-time-distance and pressure-time-distance relations which the following theories of seismic wave propagation must meet:

(1) Spherical wave propagation based on the mathematical theory of elasticity,
(2) Sharpe's theory of spherical wave propagation,
(3) Ricker's wavelet theory, and
(4) Born's concept of frictional damping.

A description is given of the instrumentation and field work involved in obtaining 300 two-trace pressure-time records and 50 twelve-trace ground-motion records. The seismic ground-motion records were obtained simultaneously with pressure records, and a quantitative comparison of the two types of recordings is made. These records were taken in weathered and unweathered shales and limestones, at distances of from two to two hundred feet from the shot, and using charges ranging from dynamite caps to 25 pounds of commercial explosive.

Empirical equations are found relating pressure peak magnitude and distance from the shot, pressure peak magnitude and charge size, and pressure peak magnitude and maximum charge fired previously.

The author further derives quantitative and qualitative descriptions of pressure waveform pulse breadth and pressure peak magnitude as functions of lithology, variation of pressure waveform pulse breadth with travel through shale and limestone, variation of seismic velocity with direction in shale and limestone, effect of reflections and refractions on pressure record waveforms, and relation of charge size to first arrival time.

The data obtained are applied where practical to the theory tests described above. The author outlines conditions which a new theory must meet to satisfy the data obtained.

Besides the 70 pages of text, this Quarterly includes 18 illustrations showing equipment, circuit diagrams, and sample trace patterns. Much of the experimental data is presented in a series of 20 graphs. This Quarterly was lithographed, has paper covers, is priced at $1.50 (postpaid in the United States), and may be purchased from the Publications Department, Colorado School of Mines, Golden, Colorado.

News of Related Organizations

Georgia Association of Registered Land Surveyors

From the latest issue of *Field Notes,* monthly publication of the Georgia Association of Registered Land Surveyors, we learn that the new officers of that organization for the 1956–57 year are as follows: H. L. Jackson, *President;* Sommers J. Gostlin, *Vice President;* J. Harold Smith, *Secretary-Treasurer;* R. M. Marbury, Jr., *National Representative;* J. C. Burroughs, *Alternate National Representative.* The following are directors for 1956–57: A. W. Browning, J. J. Dean, R. C. Kauffman, H. L. McSwain, and C. R. Roberts.

The plans and objectives for the coming year of this 140-member organization include (1) sponsorship of another short course in surveying at Georgia Tech in the spring, (2) doubling of its membership, and (3) participation in the purchase of a building in Atlanta to house the GARLS as well as other engineering and architectural societies.

Massachusetts Association to Hold Annual Meeting

The Massachusetts Association of Land Surveyors and Civil Engineers announces that its 1956 annual meeting will be held November 30 and December 1 at the Hotel Bradford, Boston. The program, which is practically complete, should prove to be of considerable interest. Invitations are extended to all interested parties to attend and participate, particularly surveyors from the neighboring States of Maine, New Hampshire, and Vermont who do not belong to any organized professional group. Information on program details may be obtained from Llewellyn T. Schofield, Secretary of the Association, 48 Park St., Framingham, Mass.

At its annual business meeting, held recently, the following officers were elected for third terms: Gordon E. Ainsworth, *President;* Llewellyn T. Schofield, *Secretary;* and Newell B. Snow, *Treasurer.* Directors elected for 1956–57 are as follows: *Cape Cod*—Newell B. Snow and E. Joslin Whitney; *Eastern Massachusetts*—Philip J. Baird, Jr., and Robert E. McCarthy; *Central Massachusetts*—Charles M. Kelley and Henry Robinson; *Connecticut Valley*—Gordon E. Ainsworth, A. Phillips Bill, and Merton C. Smith; and *Berkshire*—Robert B. Deloye and Adolph J. Kolhofer.

—Gordon E. Ainsworth
President, MALSCE

El Agrimensor

Agrimensura, Publicación de la Asociación de Agrimensores del Uruguay, Montevideo, December 1955, carries, just inside of and facing the front cover, an excellent color plate showing a reproduction of the painting "El Agrimensor" by Leon Palliére.

The picture shows a mounted survey party, all halted at an instrument station except for one rider carrying a flag on the distant horizon. The central figure is the surveyor, with his instrument set over a station. The rest of the party is grouped around him, except for the lone rider on the horizon, with all the men and most of the horses paying evidently strict attention to the man with the instrument.

The following (translated from the Spanish by Francis J. Ortiz, Coast and Geodetic Survey) is from the back of the color plate and is published by way of explanation.

"The Surveyor" is a drawing by the well-known French painter and engraver: "Leon Palliére (1823–1887).

During the decade 1856–66 Palliére travelled in Argentina, Chile, Uruguay, and the south of Brazil collecting water colors, oil paintings, and engravings typical of the regions visited.

In the entire Palliére Album of "The Surveyor" printed in Buenos Aires in 1864, in the two tone lithographic process, the author has collected 52 of his most characteristic works.

The lithography is a reproduction of an original water color published by the courtesy of the National Historic Museum where it is preserved.

CONGRESS NEWS

Topography Division—ACSM

The tranquil routine of the Topography Division of ACSM has been somewhat upset this year as a result of personnel changes in the U. S. Geological Survey.[1] As a result of the shuffle and the failure to hold an election, certain Division offices became vacant under parliamentary declaration. Nominated candidates of the Topography Division have been appointed by President Higbee to fill the vacancies until a regular election can be held.

The officers of the Topography Division now serving are: *Chairman*—Roland H. Moore[2] and *Directors*—Bennett Jones, Benjamin Munroe, Carl Alster, Lloyd Marsden, Page F. Hopkins,[2] and Harold Williams.[2]

[1] *See* SURVEYING AND MAPPING, Vol. XVI, No. 2, April–June 1956, page 132.

[2] Appointed by President Higbee.

Southern California Section

The Joint Education Committee of the Northern and Southern California Sections of ACSM and the Council of Civil Engineers and Land Surveyors is investigating the possibility of setting up courses, in various parts of the State, for those persons desiring to better themselves in the fields of surveying or drafting room computations. Questionnaires have been sent to all members of all three organizations to determine their wishes as to course content. The courses being considered range from elementary plane surveying through geodetic surveying and machine calculations to photogrammetry and coordinate computations. The possibility of issuing a certificate of completion is being considered. California surveyors interested in this program should contact either Charles R. Herr, Surveying Instructor, Pasadena City College, or Daniel E. Whelan, Jr., Dean of Engineering, Loyola University, Los Angeles.

The Southern California Section has laid plans for its regular October meeting, to be held on October 5, 1956, in the General Petroleum Auditorium, Los Angeles. Two fine speakers, well versed in their subjects, have been slated. Harold E. George, Executive Secretary, Colorado River Boundary Commission, State of California, will discuss "The Questionable Colorado River Boundary," and William C. Wattles, registered civil engineer and land surveyor, will discuss "The Assumptious Surveyor."

The Second Annual Joint Meeting of the Northern and Southern California Sections, held at Santa Barbara on May 11 to 13, was an unqualified success. There were 173 paid registrations and over 200 in attendance, counting guests. While the members demonstrated their enthusiasm by the fine attendance and the lively discussions at all sessions, the ladies had a particularly good time with trips to various private gardens throughout the city, to the harbor, and to the Santa Barbara Mission.

Plans call for the Third Annual Joint Meeting to take place at about the same time of year in 1957 at either Carmel or Monterey, Calif.

Approximately 100 engineers and surveyors attended the Section's Annual Field Day at the UCLA campus on June 2. Those in attendance spent a memorable and profitable day, with the morning devoted to field demonstrations and the afternoon taken up with talks and demonstrations in an auditorium on the campus.

The field demonstrations included the testing of 300-foot tapes by crews of the City of Los Angeles, a demonstration of precise chaining with steel tape and chaining bucks, and a trig-traverse demonstration. The latter, a fast method of obtaining long distance measurements in rough or mountainous country based on establishing a short base line at right angles to the distance to be determined, was a particularly applicable demonstration for Southern Californians.

The indoor sessions included talks and demonstrations on theodolites by employees of the City

of Los Angeles Geodetic Section and a discussion of the proper corrections to be used in steel taping. It was disclosed that numerous tests by the Geodetic Section show that the temperature correction is especially vital when work is done at above 90 degrees Fahrenheit.

On display during the day were examples of late-model surveying instruments, including a 20-second Japanese transit which drew a great deal of attention.

—Harvey E. Rookus
Section Editor

Colorado Section

The second quarterly meeting of the Colorado Section of the American Congress on Surveying and Mapping was held June 21, 1956, in the Library of the Colorado School of Mines, Golden, Colo. A very interesting and truly informative program, based on the theme "Surveying at Mines—An Important Part of the Curriculum," was presented by members of the Engineering Staff of the Colorado School of Mines.

Prof. Thomas A. Kelly, Chairman of the Colorado Section, gave an introductory talk and stressed the importance of surveying and its applications. He also extended a welcome to all members present.

Stanley M. Borrell, General Chairman for the 1956 ACSM-ASP Convention and Co-Exhibit to be held in Denver, Colo., September 30 to October 2, 1956, gave a detailed report on plans and progress to date for this fall convention.

Well-presented talks were given, as follows, by members of the Engineering Staff:

Ben Parker spoke on the subject of mine surveying and the many problems encountered in this type of work.

Francis Smiley covered the important field of photogrammetry in surveying. This is a growing field, and it is appropriate to mention that the Colorado School of Mines, with comprehensive courses in surveying and photogrammetry, is one of the leading schools in the country.

Steve Kanizay spoke on the geological surveying at the school's summer camp at Wild Horse.

Ronald Preston presented an illustrated talk on field equipment and procedures which was very interesting and informative.

The meeting concluded with refreshments and a tour of the civil engineering, surveying, and photogrammetric departments of the school.

—George M. Perham
Secretary-Treasurer

Texas Section

The twenty-first regular meeting of the Texas Section of ACSM was held on July 20, 1956, at the auditorium of the APC Bldg., Houston. Sixty-five members and eleven guests attended.

After refreshments and an excellent barbecue dinner, Section Chairman J. A. Tomlinson opened the business session and extended a welcome to the guests.

National Vice President G. W. Herzog informed those in attendance that National President L. C. Higbee was touring the country and might pay the Texas Section a visit. He called attention to the third consecutive meetings of the national organizations of ACSM and ASP to be held in Washington next March and urged that at least 50 Texas Section members attend.

Chairman Tomlinson announced a joint meeting of the Colorado Section of ACSM and the Rocky Mountain Section of ASP to be held September 30 to October 2 at Denver.

J. S. Boyles, in reporting on the commemorative stamp for surveyors, announced that, through the combined efforts of U. S. Senators Price Daniel and Lyndon Johnson, a bill was presented to the 84th Congress, but that no action was taken before adjournment. An effort will be made, Mr. Boyles said, to present the bill to the next Congress.

Dr. B. C. Tharp of the Department of Botany, University of Texas, the speaker of the evening, gave a very interesting talk on "Texas-Oklahoma Boundary Dispute." Dr. Tharp was a member of the group of surveyors delegated to survey the Red River bed in connection with the dispute and thus was able to speak with authority and to present many interesting details of the survey and settlement.

—I. W. Perry
Secretary

(*Continued on page 386.*)

Membership Roster

American Congress on Surveying and Mapping

December 31, 1955

Membership Roster

American Congress on Surveying and Mapping

This roster includes all members in good standing on December 31, 1955, according to the official records of the Congress. It includes the 125 new members published in Vol. XVI, No. 1 and 60 of the 186 new members published in Vol. XVI, No. 2. All members are urged to advise the Executive Secretary promptly of errors and omissions.

ALPHABETICAL LIST OF MEMBERS

HONORARY MEMBERS

COLBERT, Rear Adm. Leo Otis, 4408 29th St., N.W., Washington 8, D. C.
PETERS, Frederick Hathaway, 33 Main St, Aylmer East, P. Q., Canada
RANDALL, Robert H., Chief Examiner of Surveying and Mapping, Bureau of the Budget; 4009 East-West Highway, Chevy Chase 15, Md.
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Tewinkle, M. A.
Therrell, W. T.
Trow, S. W.

Fort Clayton
Vick, J. E., Jr.

Colorado—122

Arvada
Kawakimi, F. M.
McCoy, L. L.
Zuck, J. C.

Aurora
Donohue, J. J.

Colorado Springs
Scott, G. D.

Craig
Shaw, E. L.

Denver
Alexander, E. G.
Anderson, J. M.
Antilla, R.
Arnold, C. N.
Bachtel, D. H.
Baldwin, J. B.
Ballard, J. A.
Basham, F. A.
Bayles, Miss C. M.
Benes, I. J.
Benfell, V. S.
Bentley, L. E.
Bock, S. A.
Borrell, S. M.
Brown, C. H.
Calvert, W. R.
Clark, E. M.
Cleaver, S. E.
Clemens, J. R.
Clements, J. V.
Coon, E. J.
Cox, K. D.
Cummins, T. V.
Dannemann, H. R.
Davis F. M.
Davis, R. O.
Dickinson, C. F.
Dyer, James T.
Dyer, Jesse C.
Ehrich, W. D.
England, A. G.
Faas, D. M.
Fensten, H. C.
Foley, R. C.
Forney, G. D.
Franks, J. B.
Gervais, A., Jr.
Gregg, F. L.
Groves, S.
Gumm, C. L.
Harden, B. J.
Harmel, M. A.
Haste, G. R.
Hendrickson, L. H.
Hickman, M. L.
Holloway, H. R.
Howell, R. L.
Jeppesen, E. B.
Johnson, O. S.
Johnson, P. H.
Kail, P. B.
Kautz, W. A.
Kennedy, W. V.
Kordziel, A. J.
Labbe, C. A.
Langhofer, J. H.
MacDonald, R. C.
McCann, J. J.
McClelland, E. E.
McLaughlin, W. A.
McQuaid, D. J.
Miller, K. B.
Minnie, J. A.
Mundine, J. E.
O'Brien, T. J.
Palmer, E. E.
Parker, H.
Perham, G. M.
Peterson, D. K.
Prouty, W. L.

Puleo, J.
Recktenwald, J. J.
Schwartz, B. L.
Smith, H. W.
Smith, W. G.
Starbuck, J. G.
Tanner, J. J.
Toomey, W. A.
Upton, W. B., Jr.
Van Skiver, D. D.
Vidmar, A. L.
Westfall, W. H.
Williams, A. T.
Young, J. D.
Zydik, J. W.

Edgewater
Gessley, I. H.
Niki, J. W.

Englewood
Green, J. D.
Tschantz, W.

Fort Carson
Elkin, L. D.

Fort Collins
Sackett, T. H.

Glenwood Springs
Walker, T.

Golden
Babcock, H. A.
Bay, Mrs. C. G.
Blake, P.
Boggess, B. L.
Kelly, T. A.

Grand Junction
Platt, N. B.

Lakewood
Basham, W.
Brown, G. E.
Collins, J. G.
Erzen, B. T.
Ganahl, L. W.
Groninger, J. G.
Lawson, J. M.
Massey, H. A.
Shrefler, D. G.
Smith, H. H. B.
Zalewski, M. H.

Littleton
Hopkins, C. A.

Westminster
Cochran, T. R.

Wheat Ridge
Dorsey, R. E.
Soderberg, C. N.
Swasey, E.
Townsend, H. M.
Windham, E. O.

CONNECTICUT—58

Ansonia
Clarke, V. B.

Avon
Delbone, J. P.

Bridgeport
Fray, W. C.
Penny, F. C.
Roberts, R. B.

Burlington
Alderman, R. E.

Canaan
Lambert, W. D.

Collinsville
Alderman, H. E.

Danbury
Rapp, S. A.

Derby
Thompson, G. E.

East Hartford
Olshesky, J. J.

East Haven
Miller, C. H.

Essex
Pelton, G.

Glastonbury
Mozzochi, J. J.

Glenbrook
Morrison, W. D.

Greenwich
Bond, F. C.

Hamden
Reynolds, W. A.

Hartford
Balko, W.
Skilton, H. I.
Soehle, W. E.
Sullivan, E. B.
Sullivan, E. J.

Manchester
Giovannini, E.

Middletown
Cannon, S. C.

Milford
Allen, S. E.

New Britain
Williams, J. D.

New Haven
Beach, J. C.
Cahn, C. A.
Farnham, C. S.
Leighton, K. W.
Pulver, J. W.
Vreeland, R. P.
Williams, R. L.

Newington
Fresen, E. C.
Harding, L. L.
Holsten, W. L.

Norwalk
Hubbell, C. C.

Norwich
Gray, E. J.

Old Saybrook
Chalker, M. B.

Putnam
Perry, G. F.

Riverside
D'Andrea, R. V.

Rockville
Chambers, R. H.

Salisbury
Knickerbocker, H.

South Glastonbury
Megson, H. K.

Stamford
Gregory, H. W.
Salnajs, V.

Stratford
Rowe, T. D.

Thompsonville
Savage, W. E., Jr.

Torrington
Nierintz, W. F.

Unionville
Hodge, M.

Wallingford
Boyce, R. I.

Waterbury
Christofferson, E. H.
Schmidt, E. F.
Trowbridge, F. J.

Watertown
Lewis, J. S.

Wethersfield
Bisio, A. L.
Humphreys, J. K.
Langtry, S. F.

DELAWARE—9

Bear
Faunce, H. L.

Wilmington
Barkley, R. J.
Donath, W.
Klekotka, J. J.
Lee, J. W.
Lehm, W. C.
Myers, R. C.
Price, F. S.
Van Demark, E. S.

DISTRICT OF COLUMBIA—209

Washington
Adkinson, B. W.
Alpaugh, W. A.
Alster, C. J.
Anderson, S. F.
Anderson, W. J.
Andrews, J. A.
Bay, H.
Bean, H. A.
Belton, R. J.
Bhodhiphala, P.
Biba, F. J.
Bigelow, H. W., Jr.
Briggs, A. P.
Bloom, L. A.
Blozis, J. T.
Borden, F. S.
Braaten, N. F.
Braund, J. J.
Bray, J.
Brooks, H. R.
Brown, E. B.
Brown, W. N.
Buckmaster, J. L.
Buettner, A. J.
Bumstead, N.
Carey, K. P.
Cheeseman, J. A., Jr.
Chinn, M. W.
Church, J. P.
Clement, D. B.
Colbert, L. O.
Cook, M. M.
Coombs, A. H.
Coutinho, J. deS.
Cowart, T. C.
Crotinger, L. I., Jr.
Crump, W. C.
Darley, R. J.
Davies, C. H.
Deane, W. F.
Dill, P. A.
Dingman, L. F.
Disney, L. P.
Dix, W. S.
Doffiemyer, C. E.
Doran, P. C.
Duerksen, J. A.
Earle, R. A.
Eller, R.
Engdahl, R. L.
Engen, G. A.
Evans, R. T.
Evans, W. F.
Eyman, R. P.
Fennell, E. J.
Finnegan, H. E.
Fish, G. R.
Flint, G. M., Jr.
Franklin, Miss L. E.
Frew, R. L.
Friberg, C. R., Jr.
Friis, H. R.
Fuechsel, C. F.
Fuller, H. C.
Garber, H. F.
Garner, C. L.
George, V. D.
Gerlach, A. C.
Gore, W. F.
Graham, C. R.
Greene, D. L.
Grimes, E. G.
Guimares, F. J. S.
Guthe, O. E.
Haley, L. A.
Harrington, E. G.
Haupt, R. W.
Havre, Miss G.
Hemple, H. W.
Hogan, N. B.
Hoskinson, A. J.
Hough, F. W.
Johnston, D. W.
Jones, B. G.
Jones, D. A.
Jones, E. E.
Jones, F. L.
Jones, M. R.
Judson, L. V.
Kalbfleisch, A. C.
Karo, H. A.
Kaufman, H. P.
Keegan, K. B.
Kelsh, H. T.
Kendall, A. W.
Kern, K. C.
Kilmartin, J. O.
Klove, R. C.
Knox, R. W.
LeGear, Mrs. C. E.
Leifson, G.
Liebrecht, L. C.
Littlepage, G. B., Jr.
Locraft, B. F.
Lushene, J. P.
Lyddan, R. H.
Magid, J.
Maltby, C. S.
Mangan, Mrs. G. A.
Mannar, B. W.
Mathisson, J. C.
Mays, R. R.
McAleer, R. E.
McGann, L. A.
McGovern, J. H.
Meade, B. K.
Miles, E. P.
Mills, D. L.
Miscoski, V. T.
Mock, G. A.
Monday, F. E.
Moore, L. C.
Morris, G. W.
Moss, W. H.
Natella, F.
Newlin, D. B.
Noakes, A. H., Jr.
Nolan, T. B.
Norcross, F. T.
Nowicki, A. L.
Pachimkul, S.
Parkin, E. J.
Pates, J. R., Jr.
Pearson, A. R.
Perry, Miss K. E.
Petty, A. J.
Powell, A. L.
Pumpelly, J. W.
Randall, R. H.
Randall, R. H., Jr.
Randall, W. E.
Rappleye, H. S.
Reed, C. R.
Reed, H. D., Jr.
Reshew, J. W.
Richmond, A. E.
Riddell, F. A.
Ristow, W. W.
Risvold, O. S.
Rittenburg, I. E.
Rodriguez, E. D.
Ross, R. B.
Roudabush, M. A.
Rowland, J. B.
Runyan, R. H.
Samuel, C. B.
Sanders, I. T.
Sangster, J. G.
Saucerman, Mrs. S. A.
Savage, F. L.
Schaler, O. G. J.
Schechter, I.
Schmid, E.
Scott, D. K.
Serveson, E. H.
Shalowitz, A. L.
Shearer, N. E.
Shelton, C. A.
Shofnos, W.
Skinner, P. H.
Simmons, L. G.
Sipe, R. J.
Smart, L. R.
Snowden, S. L.
Snyder, E. T.
Speert, J. L.
Starbuck, T. W.
Stiefel, A. C.
Straw, L. S.
Stroup, W. B. W.
Swan, D.
Swanson, L. W.
Sweet, A. J.
Symms, C., Jr.
Thoma, J. C.
Thompson, G. J.
Thompson, M. M.
Thornton, R. J.
Thurston, R. F.
Tonkel, M. J.
Trei, A. P.
Turnure, R. F., Sr.
Wallace, T. S.
Wardwell, A. L.
Watson, D. H.
Whitmore, G. D.
Whitten, C. A.
Wiczer, M. A.
Wilcox, L. E.

Williams, F. G.
Williams, H.
Williams, J. R.
Wilson, J. K.
Winiarski, K. J.
Witkege, F. L.
Wood, Helen M.
Workman, W. G., Jr.
Wrather, W. E.
Zenns, A.

FLORIDA—58

Bradenton
Hays, G., Jr.
Clearwater
Albrecht, W. B.
Fernandina
Lovesee, G. W.
Fernandina Beach
Thigpen, H. M.
Fort Lauderdale
Butler, J.
Fort Walton Beach
Smith, H. P.
Gainesville
Bransford, T. L.
Hollywood
Berry, M. E.
Jacksonville
Angas, R. M.
Barnard, J. G.
Cogswell, A. R.
DeGrove, R. H.
Gillespie, W. W.
Mainey, L. H.
Southworth, A. M.
Williams, H. L.
Jupiter
Studds, R. F. A.
Lakeland
Kelson, T. L.
Live Oak
Drew, H. J.
Marathon
Goggin, J. P.
Melbourne
Greever, J. J.
Miami
Beswick, H. W.
Christenson, J. A.
Shenker, N. H.
Waldenmaier, B. A.
North Miami
Ringle, J. D.
Ocala
Moorhead, J. R., Jr.
Orlando
Clawson, E. M.
Darling, J. W.
Dickinson, W. R.
Hart, W. C.
Hufty, R. M.
Hunkapiller, B. B.
Jones, R. H.
Wolf, W. W.
Palm Beach
Bartoo, D. G.
Pass-a-Grille Beach
Williams, W. D.
Patrick Air Force Base
Bennett, M.
Pensacola
Comstock, R. D., Sr.
Porter, T. P., Jr.
Ponce de Leon
Haas, C. W.
St. Petersburg
Anderson, G. L.
Binyon, H. A.
Peacock, F. L.
Waugh, J. E.
Young, G. F.
Sarasota
Mosby, J. V.
Pavitt, R. W.
Starke
McMillan, M. G.
Tallahassee
Beazley, J. S.
Matthews, A. G.
Tampa
Kelley, T. W.
Tavares
Moorhead, T. O.
Titusville
Schuster, F. P.
Vero Beach
Jennings, J. G.
West Palm Beach
Bracewell, J. R.
Brockway, G. S.
Wirsig, J. G.

GEORGIA—37

Atlanta
Bingham, W. H.
Black, R. P.
Boroughs, J. C.
Buck, R. W.
Bush, H. L.
Fitzpatrick, H. V.
Lucas, J. H.
Roberts, C. R.
Robison, H. O.
Smith, J. T., Jr.
Thomas, C. M.
Augusta
Grow, G. S.
Hall, M. W.
Columbus
Carr, G. V.
Cornelia
Carey, J. F.
Decatur
Hooks, J. M.
East Point
Moore, J. W., Jr.
Morgan, D. S.
Forest Park
Gibbon, L. P.
Forsyth
Wade, J. W.
Gray
Smith, T. E.
Jewell
Dickson, W. D.
Macon
Gordon, J. A., Jr.
Gostin, S. J.
Lester, F. E.
McSwain, H. L.
Sherrill, J. W.
Winchester, T. H., Jr.
Milledgeville
Rice, C. W.
Molena
Smith, J. H.
Patterson
Porter, J. J.
Savannah
Cox, C. L.
Earle, T. B.
Garmany, H. M.
Knight, E. C.
Sylvania
Bell, R. L.
Waycross
Gowen, J. D.

GUAM—2

Agana
Robinson, F. A.
Guam
Salas, J.

HAWAII—15

Honolulu
Armitage, J. H.
Chock, S. L.
Chrystal, J., Jr.
Correa, M. P.
Fankhauser, A.
Fortin, H. O.
Kanahele, F. H.
Mahan, R. O.
Thomas, W. M.
Thompson, W. P.
Towill, R. G.
Hilo
Towill, H. F.
Kamuela
Wright, S.
Kaneohe
Olds, C. J.
Wailuku
Souza, M. R.

IDAHO—9

Boise
Harris, B.
Coeur d'Alene
Miller, T. O.
Grangeville
Montell, J. E.
Kellogg
Park, M. A.
Preston, K. L.
Moscow
Sibley, E. A.
Pocatello
Hall, W. H.
Rupert
Coon, L. B.
Salmon
Colner, H. M.

ILLINOIS—95

Antioch
Cranley, E. P.
Aurora
Berg, T. M.
Brookfield
Murry, R. W.
Centralia
Hopkins, L.
Champaign
Anderson, E. M.
Charleston
Gierhart, J. W.
Chicago
Arentz, A. A., Jr.
Bacon, R. H.
Cahill, W. D.
Cunnea, J. P.
Farum, S. W.
Fitchet, D. M.
Jandacek, G. W.
Kahles, M. J.
Kozak, A. F.
Kraft, E. W.
Marnul, J.
Mitchell, C. D.
Monsen, M. T.
Nelson, E. E.
O'Connor, C. J.
Odell, C. B.
Panko, W. B.
Pasquinelli, S.
Petrowski, F. J.
Pilsudski, J.
Pratz, C. H.
Price, E. E.
Rebitzer, F.
Schimming, A. B.
Schmitt, A. C.
Schneider, E. J.
Senechalle, L. J.
Shapiro, S. E.
Smith, E. M.
Studnicka, J. S.
Van Meer, E.
Wray, J. R.
Cicero
Zelenka, A. J.
Decatur
Burgener, H. J., Sr.
Elrod, L. E.
Huseman, K. J.
Jones, R. E.
Morse, F. S.
Deerfield
Greengard, C. W.
Dixon
Anderson, D. D.
Willett, C. K.
Downers Grove
Einarson, R.
Wight, R. B.
East St. Louis
Cooper, J. S., Jr.
Elgin
Joseph, M. M.
Evanston
Espenshade, E. B., Jr.
Gamet, M. B.
Ruxton, W. S., Jr.
Farmer City
Brown, C. W.
Galesburg
Gaston, R. E.
Lieber, F. R.
Pappmeier, L. S.
Granville
Bouxsein, I.
Harvey
Chlebicki, G. J.
Robinson, R. W.
Havana
Cordes, J. H.
La Grange
Verrill, G.
Moline
Boudinot, A. R.
Mt. Prospect
Pathe, C.
Northbrook
Canmann, H. L., Jr.
Ottawa
Sexton, F. E.
Park Forest
Nowicki, R. A.
Pekin
Reeder, C. D.
Peoria
Halvorson, A. R.
Horton, P. Z., Sr.
Rockford
Derr, C. W.
Holmquist, J. H.
Lundgren, A.
Moring, L. D.
Polkowski, F. G.
Rock Island
Adland, E. R.
Reese, W. J.
Springfield
McKibbin, J. C.
Urbana
Booth, A. W.
Danner, C. S.
Dell, G. H.
Ekblaw, G. E.
Eldridge, W. H., Jr.
Foster, F. W.
Kinch, M. H.
Murthy, V. N. S.
Rayner, W. H.
Schmidt, M. O.
Walker, L. D.
Waukegan
Dixon, G. M.
Dragesevich, J. A.
Wheaton
Steinbrecher, H. F.
Webster, E. E., III
Winnetka
Dietzgen, J. E.

INDIANA—49

Angola
Savovich, N.
Wood, C. B.
Battleground
Camp, W. E.
Boonville
Bush, R. E.
Samples, R. E.
Columbus
Crowder, G. A.
Corydon
Doolittle, G. C.
Crown Point
Brownsten, S. E.
East Chicago
Rakowski, J.
Evansville
Goad, Miss M.
Fort Wayne
Hofer, A. K.
Pyle, A. L.
Smith, O. C., Jr.
Yeager, W. H.
Hammond
Laslow, J.
Leisure, C.
Lippman, R. L.
Todd, J. H.
Hobart
Krull, R. A.

Huntingburg
Helm, J. R.
Indianapolis
Grimes, J. S.
Hoff, C. W.
Prescott, W.
Scaggs, W. E.
Scotten, E. F.
Shartle, S. M.
Thompson, C. L.
Unversaw, F. J.
Jasper
Schneider, J. W.
Kokomo
Martin, R. L.
Morrison, J. W.
Knox
Smrt, J. B.
Lafayette
Curtis, K. S.
LaPorte
Morris, R. E.
Marion
Wilson, J. E.
New Albany
Condra, C. E.
New Paris
Rock, D. C.
Paoli
Grosvenor, I. R.
Rensselaer
Kirk, H. T.
Richmond
Thornburg, P.
Rockport
Oldham, H. G.
Salem
Huston, P. G.
Shelbyville
Smith, R.
South Bend
McClellan, B. G.
Moore, W. S.
Warren, A.
Terre Haute
Kidder, A. D.
West Lafayette
Egner, C. A.
Lommel, G. E.

Iowa—14

Ames
Lubsen, R. J.
Belmond
Murray, L. W.
Cedar Falls
Wardin, R. W.
Cedar Rapids
Behrens, W. H.
Lilly, J. H.
Clinton
Tallett, J. F.
Council Bluffs
Mayne, J. H.
Des Moines
Holmes, A. E.
Little, R. E.
Estherville
Brown, N. K.
Fort Dodge
Miller, G. H.
Ottumwa
Upp, O. T.
Sioux City
Gaynor, K. C.
Tipton
Henry, W. L.

Kansas—17

Ashland
Robbins, E. L. V.
Baxter Springs
Puterbaugh, C. B.
Kansas City
Chandler, R. L.
Stockdale, D. R.
Lawrence
Jenks, G. F.
Manhattan
McEntyre, J. G.
Shaw, R. N.
Mankato
Mayse, M. M.
Marion
Meisner, J. F.
Mission
Bell, J. L.
Ledbetter, J.
Overland Park
Ware, C. L.
Salina
Wyatt, W. C.
Shawnee
Noftzger, R. L.
Topeka
Cook, N. T.
Wichita
Landis, M. P.
Payne, L. E.

Kentucky—10

Hindman
West, O. J.
Lexington
Miles, P. M.
London
Graham, J. H.
Louisville
Riley, F. C.
Welch, C. W., Jr.
Madisonville
Donan, J. G.
Mt. Sterling
Bigstaff, J. M.
Owensboro
Thompson, J. E.
Paducah
Hollis, E. Y., Jr.
South Carrollton
Pope, F. H.

Louisiana—107

Alexandria
David, T. C.
Lafargue, I.
Arabi
Code, J., Jr.
Bastrop
Messinger, H. M.
Baton Rouge
Harrison, H. N., Jr.
Harrison, S.
Hayne, H. M.
Nilson, E. R.
Percy, R. D.
Sessums, F. B.
Bogalusa
Allen, C. H.
Todd, J. E.
Bossier
Mongno, T. E.
Cottonport
Marchand, B. J.
Crowley
Letz, P. J.
Gretna
Morgan, W. J.
Hammond
Keck, W. G.
Harvey
Brawley, A. L.
Dickmann, J. P., Jr.
Hicks, J. L.
Laborde, A. W.
Richoux, W. P.
Sneed, H. G.
Houma
Bridges, C. E.
Davis, J. H.
Manning, W. L.
Moore, T. G.
Ritchie, F. M.
Smith, T. B.
White, A. J.
Jeanerette
Glaubrecht, G. J.
Kenner
Hansen, A. K.
McMullen, L.
Lafayette
Ballard, G. F.
Browning, R. F.
Chance, J. E.
Oeser, C. A.
Lake Charles
Oblinger, H. L.
Shutts, F. N.
Shutts, H. H.
Long Leaf
Hulett, A. D., Jr.
Metairie
Baker, R., Jr.
Glodt, A. A.
LaRosee, P. H.
Monroe
Garnett, V. S.
Huey, S. E.
Morgan City
Ingram, J. D.
New Iberia
Fenstermaker, C. H.
Kohnke, P. E.
New Orleans
Ashton, J. A.
Behling, A. H.
Boesch, W. E.
Brooks, R. L.
Brown, T. B., Jr.
Burnside, R. S., Jr.
Chapman, S. P.
Dayton, R. C.
Deal, K. E.
deLeon, D. E.
DeLerno, J.
Fontcuberta, J. L.
Fox, F. H.
Fox, J. A.
Frank, F. L.
Gastrock, H. N., Jr.
Glass, C. G.
Green, O. B.
Haight, E. C.
Haydel, E. A.
Jackson, J. H.
Johnson, M. F.
Jones, G. E.
LeCompte, W. J.
McCurdy, H. B., Jr.
McNeil, A. M.
Mott, G. E.
Parsons, E. D., Jr.
Porter, R. R.
Pritchard, E. H.
Rainey, J. M.
Robichaux, C. P.
Romig, J. C.
Rordam, R. B.
Sanders, E. M.
Schmidt, R. M.
Schwartz, J. C.
Standard, C. M.
Standard, M.
Stokes, J. D.
Swartz, S. M.
Taylor, J. E., Jr.
Taylor, W. E.
Toler, J. S.
Trammell, W. J.
Warren, G. F.
Webb, R. B.
Opelousas
Mayne, P. J.
Plaquemine
Hedden, W. L.
McDonald, L. P.
Shreveport
Branch, C. O.
Downs, D. R.
Foster, A. E.
Morris, C. T.
Sulphur
LeVasseur, A. J.
Thibodaux
Heck, C. E.
Vidalia
Sessions, J. P.
West Monroe
Carter, J. L.

Maine—13

Camden
Breed, C. B.
Cape Elizabeth
Hatch, F. B.
Machias
Mawhinney, R. A.
Old Town
Shea, H. J.
Orono
Kinney, R. A.
Portland
Barron, C. H.
Simpson, B. A.
Presque Isle
Dingwall, D.
Prospect Harbor
Merriam, C. F.
Rumford
Foster, W. K.
Skowhegan
Sidelinger, R.
Waldoboro
Gross, E. H.
Winthrop
Libby, A. C.

Maryland—146

Aberdeen
Tamkus, S. A.
Annapolis
Lubbers, L., Jr.
McCrone, J. R., Jr.
Baltimore
Brown, L. A.
Cassell, G. R.
Cassell, G. W.
Childs, W. F., Jr.
Cloonan, T. L.
Duvall, B. O.
Ewell, W. H.
Glaser, R.
Grace, C. D.
Hacker, T. W.
Hoke, W. B.
Hunt, J. C.
Kahl, W. R.
Kirby, E. J.
Mercer, E. W., Jr.
Phillips, Miss J. B.
Pritchett, N. M.
Quimby, Miss H. M.
Rudolph, H. R.
Shoemaker, W. L.
Steinberg, J.
Sutcliffe, D. K.
Sutcliffe, W. D.
Tarcza, F. J.
Vijinovic, M.
Weissenstein, H. G.
Wisieki, F. M.
Beltsville
Casparovic, W. S.
Bethesda
Andregg, C. H.
Brelick, J.
Davidson, J. I.
Druhot, G. S.
Glassberg, H. I.
Griffith, S. V.
Kelly, G. R.
Koenig, R. A.
Lundahl, A. C.
Sears, W. B.
Sheridan, E. H.
Simonson, W. H.
Wilson, R. M.
Bladensburg
Junek, F. F.
Boyds
Finley, C. G., Jr.
Camp Springs
Moitoret, V. A.
Capitol Heights
Davis, J. R.
Swick, C. H.
Cheverly
Davis, W. S.
Sawchuk, H. A.
Strees, L. V.
Chevy Chase
FitzGerald, G.
Munroe, B. H., Jr.
Norcross, T. W.
Randall, R. H.
Reeves, R.
Riemer, A. A.

College Park
Holderbaum, E. M.
Karinen, A. E.
Dundalk
Balling, L. J.
Easton
Blain, R. H.
Edgewater
Latimer, P. A.
Elkton
Benson, H. F.
Ellicott City
Emminizer, G. K., Jr.
Skinner, C. M., Jr.
Ferndale
Gwynn, A. P.
Frederick
Walter, W. R.
Frostburg
Hartig, P., Jr.
Gaithersburg
Seaquist, E. O.
Glen Burnie
Snyder, R. G.
Greenbelt
Feldman, S.
Hagerstown
Charles, B. G.
Harundale
Graff, J. E.
Hyattsville
Baird, W. E.
Cook, W.
Dyer, B.
Gornitsky, R.
Greenhorne, M. F. H.
Meredith, G. P.
Seppelin, T. O.
Skelton, R. H.
Swenson, P. B.
Kensington
Dunich, J. P.
Ofenstein, C. E.
Overstreet, W. B.
Wakefield, E. J.
Zimmerli, A. B., Jr.
Laurel
Wills, G. A.
Marlboro
Banks, W. G.
Mt. Rainier
Rosenfield, G. H.
Pikesville
Knecht, A. H.
Riverdale
Nygard, V.
Rockville
Berthold, H. A.
Garland, J. L.
Peele, W. T.
Sherman, S.
Silver Spring
Allen, J. J., Jr.
Berman, C. A.
Black, L. D.
Curtis, H. L.
Ellis, W. T.
Engelbrecht, F. B.
Everett, G. H.
Greathouse, W. C.
Hain, E. L.
Hanrahan, V. J.
Hart, F. M.
Hays, L. A.
Hopkins, P. F.
Hoshide, T.
Koka, N. C.
Kowalczyk, C. E.
Kozakis, J. T.
Maddox, S. R.
Rice, D. A.
Schechter, B.
Schlatter, E. J.
Skop, J.
Stanley, A. A.
Stegman, H. F.
Tewinkel, G. C.
Ward, A. B.
West, G. R.
Sparks
Pearce, J. H., Jr.
Spencerville
Shaw, E. M., Jr.
Suitland
Medina, G.
Takoma Park
Davey, C. H.
Denault, M. F.
Gilbert, F. P.
Griffin, Miss E. M.
Maloy, F. J.
Mathews, J. B.
McNeill, T. B.
Newquist, J. W.
Timonium
Rader, L. W.
Towson
Beavin, B. E., Sr.
Dollenberg, F. H.
Kennedy, D. S.
Stephens, G. W., Jr.
Thompson, J. D.
Waldorf
Nahas, G. F.
Washington Grove
McCathran, D. L.
West Hyattsville
Klein, W.
Wheaton
Light, J. H.
Oyster, T. G.

MASSACHUSETTS—139

Adams
Cadigon, E. L.
Neff, H. C.
Roulier, J. A.
Agawam
Elasmar, J. J.
Assinippi
Jacobs, L. H.
Belmont
Selwyn, J.
Beverly
Carlin, J. R.
Richardson, K. W.
Billerica
Fleming, J. W., Jr.
Monahan, J. B.
Boston
Anderson, C. M.
Baird, C. O., Jr.
Berger, L. H.
Blanchard, B.
Feldman, H. R.
Hughes, S. V., Jr.
Johnson, E. A.
Narins, C. S.
Ullian, H. B.
Ward, E. W.
Boxford
Parkhurst, R. B.
Brocton
Anderson, R. C., Jr.
Zimarowski, J. E.
Brookline
Hennessy, J. F.
Power, J. G.
Buzzards Bay
Snow, N. B.
Tyson, J. L.
Cambridge
Raisz, E.
Cape Cod
Schofield, J. E.
Charles River
Cheney, F. L.
Clinton
Murphy, R. A.
Cochituate
Michalski, E. J.
Concord
Peters, A. C.
Conway
Murphy, A. J.
Danvers
Crawford, A. J.
Dennisport
Sweetzer, S. R.
Dorchester
Bodio, J. A.
McCabe, D. A.
East Lynn
Collette, R. C.
Fall River
Grenier, L. W.
Falmouth
White, C. A.
Fitchburg
Tarbell, R. L.
Foxboro
Johnson, R. S.
Lienesch, J. P.
Framingham
Rosenblatt, I.
Schofield, B. V.
Schofield, L. T.
Franklin
Chilson, J. W.
Harvard
Perkins, C. A.
Harwich
White, J. E.
Haverhill
Morse, C. H.
Shirner, F. N.
Holbrook
Webb, F. T.
Holden
Fox, W. E.
Holyoke
McCool, J. J.
Hyannis
Whitney, E. J.
Ipswich
Patch, C. J., Jr.
Lawrence
Cyr, C. C.
Lexington
Houdlette, E. C.
Hunter, R. W.
Skelton, E. W.
Tarr, V. S.
Lynn
Parsons, J. W.
Pressey, R. C.
Marlborough
White, G. D.
Medford
Connor, R. F.
Melrose
Start, W. P.
Merrimac
Sargent, E. P.
Metheun
Stowers, L. R.
Middleboro
Stegmaier, T. H.
Milton
Jodaitis, L. T.
Nahant
D'Arcy, R. A.
Natick
MacCarthy, R. E.
Rasche, H. H.
Thompson, R. D.
Needham
Woodbury, R. L.
New Bedford
Thomas, G. J.
Newton Highlands
Baird, P. J.
Newton Upper Falls
Dunlevy, A.
Newtonville
Ford, W. J., Jr.
McKenna, G. A.
Northampton
Ryan, F. P.
North Brookfield
Drazek, T. P.
North Quincy
Ferranti, J. F.
North Wilmington
Perkins, W. F.
Orleans
Schofield, W. L.
Palmer
Sullivan, A. E.
Pittsfield
Daniels, J. F.
DeLoye, R. B.
Forslund, H. B.
Menard, A. S.
Plymouth
Delano, J.
Quincy
Moncrief, C. E.
Reading
Emmons, F. C., Jr.
Lucas, K. A.
Perkins, D. F.
Saugus
Gerniglia, J. W.
Seaver, H.
Shrewsbury
Moore, W. T.
Parmenter, A. N.
Southampton
Huntley, A. M., Jr.
Southbridge
Leathers, N. E.
South Deerfield
Ainsworth, G. E.
Bill, A. P.
South Duxbury
Rogerson, F. C., Jr.
South Hadley
Solander, A. A.
South Hadley Falls
Jackson, T. J.
South Orleans
Edwards, Miss L. F.
Springfield
Anderson, C. E.
Smith, J. F.
Way, A. F.
Stoughton
Austin, M. E.
Taunton
McNamara, J. S.
Read, E. A.
Tripp, F. L.
Vineyard Haven
Smith, H. A.
Swift, W. F.
Walpole
McIntyre, K. E.
Waltham
Stearns, E. O.
Ware
Casey, J. T.
Watertown
McGann, M. H., Jr.
Oates, K. B.
Sullivan, J. H.
Wellesley
Harrington, J. H.
Westfield
Scott, H. E.
Walker, C. E.
Weston
Slayter, R. S.
West Wareham
Rowley, W. E.
Westwood
Holman, C. D., Jr.
Whitman
Boynton, J. C.
Wilmington
Meserve, R. L.
Winchester
Ewell, F. A.
Winthrop
Hughes, R. F.
Woburn
Canon, A. J.
Worcester
Reney, J. J.
Robinson, H. C.
Tokarz, S. R.
Turner, J.
Yarmouthport
Kelly, W. D.

MICHIGAN—104

Alpena
Scott, R. S.
Ann Arbor
Berry, R. M.
Hicks, H. S.
Jagow, R. J.
McFarlan, H. J.
Baldwin
Blass, G.
Birmingham
Gillespie, A. W.
Main, R. A.
Buchanan
Lister, L. H.
Caro
Black, R. J.

Charlevoix
Feindt, Mrs. M. C.
Cheboygan
DeLaMater, D. C.
Clio
Lapham, P. B.
Coldwater
Reed, E. R.
Dearborn
McKechnie, C. B.
Detroit
Algozino, A. H.
Basney, J. N.
Becsi, J.
Borring, N. W.
Buskirk, P. V.
Chope, I. E.
Dely, G. F.
Donoghue, T. J.
Fall, L. W.
Fox, J. A.
Hanson, T. C.
Healey, H. A.
Jewell, L. V.
Knight, C. E.
Laidly, W. T.
Lincoln, W. M.
Loeffler, M. M. J.
McMahon, J. J.
Oden, W. L.
Querfeld, D. W.
Ryba, H. H.
Salle, J. H.
Shulnburg, R. V.
Siergiej, J.
Tredinnick, D. L.
East Detroit
Ross, C. F.
East Lansing
Nothstine, L. V.
Secules, D. R.
East Tawas
Cooke, R. J.
Essexville
Klann, M. C.
Flint
Aikman, C. F.
Kraft, R. H.
West, R. C.
Grand Rapids
Donker, R. F.
Ringle, A.
Stadt, G. H.
Williams, W. B.
Harrisville
Holmes, J. H.
Highland Park
Beckley, L. D.
Ion a
Monningh, C. M.
Iron Mountain
Look, R.
Ishpeming
Hollett, G. T.
Johnson, P. S.
Koski, F. A.
Jackson
Glerow, A. O.
Harvey, M. S.
Keller, J. J.
Kalamazoo
Gibson, C.
Lansing
Abrams, T.
Bayless, J. C.
Berryman, W. C.
Hardy, G. D.
Karr, W. S.
Kauffman, R. E.
Kerkeln, E. K.
Smith, K. A.
Stephansky, J. D.
Thompson, C. W.
Winn, F.
Marshall
Camp, V. D.
Mount Clemens
Broad, H. R.
Lehner, J. D.
Mount Pleasant
Preston, H. A.
Negaunee
Brotherton, R. J.
Newberry
Sainio, E.
Painesdale
Fleming, M. A.
Paw Paw
Smith, W. Q.
Petoskey
Schweigert, T. F.
Plymouth
Bathey, D.
Pontiac
Baldwin, M. E.
Jewell, J. B.
Port Huron
Leach, T. L.
Prescott
Hook, H. C.
Roscommon
Henning, G. D.
Ostling, R. T.
Royal Oak
Smith, V. A.
Saint Clair Shores
Sicklesteel, M. E.
Saint Johns
Dembinski, F. J.
Saint Joseph
Freise, R. W.
Shepard, L. M.
Sault Ste. Marie
Beaudrie, T. A.
Wilds, R. M.
Scottville
Stephens, K. B.
Three Rivers
White, J. R.
Traverse City
Norton, J. C.
Waterford
Hahn, W. R.
West Branch
Richardson, J. E.
Whitmore Lake
Young, E.
Wyandotte
Hampton, E. L.

MINNESOTA—46

Albert Lea
Jones, C. V.
Bloomington
Kelley, S. W.
Brainerd
Anderson, D. M.
Detroit Lakes
Nedberge, C. J.
Duluth
Griffith, A. J.
Salo, J. D.
Fergus Falls
Bjorgum, K. T.
Forest Lake
Lathrop, B. G.
Grand Rapids
Benzing, S., Jr.
Sherman, O. W.
International Falls
Wood, L.
Mankato
Kircher, A. M.
Minneapolis
Boon, L. F.
Burns, J. P.
Coulter, C. E.
Curran, J. S.
Durigan, E. V.
Dusk, G. M.
Fant, J. E.
Halverson, J. M.
Hopkins, G. E.
Jackson, F. C.
Lundstrom, W. J.
Nowak, O. G.
Parker, C. H.
Peterson, E. R. T.
Solfield, R. R.
New Ulm
Schneider, H. R.
St. Louis Park
Hofstrand, H. L.
Madson, C.
St. Paul
Anker, K.
Carley, M. W.
Forsberg, W. I.
McDonough, E. B.
McNally, L.
Ramlow, W. G.
Sullivan, J. N.
Weber, D. O.
Welch, T. J.
Wilke, H. A.
Sebeka
Howard, J. E.
South St. Paul
McLagan, W.
Virginia
Lambert, L. E.
West St. Paul
McLagan, P. R.
White Bear Lake
Donaghue, J. P.
Willmar
Fisher, J. R.

MISSISSIPPI—14

Brandon
Tatum, M. E.
Canton
James, M. H., Jr.
Jackson
Dempsey, J. M.
Kajdan, H. A.
Miller, A. C.
Mills, F. S.
Nutty, W. A.
Paxson, R. K.
Williams, W. L.
Winniford, J. H.
Meridian
Damon, H. E.
Natchez
Kaiser, C. H., Jr.
Sumner
James, M. H., Sr.
Tupelo
Brownlee, J. F.

MISSOURI—71

Brentwood
Hundley, J. E.
Sanders, G. C.
Carthage
Glenn, E. S.
Cassville
Mitchell, S. E.
Columbia
Rubey, H.
Florissant
Cannell, W. D.
Crandall, C. J.
Hart, J. W., Jr.
Glendale
Baysinger, E. L.
Clemens, F. A.
Lyon, D.
Kansas City
Clute, H. M.
Hopp, R. E.
Mast, G. C.
Owens, E. H.
Sapp, C. H.
Kennett
Redman, C. C., Jr.
Kirkwood
Dixon, R. D.
Kingsley, R. H.
Tischler, S. E.
Liberty
Evans, H. G.
Macks Creek
Heavner, A. W.
New Madrid
Ice, W. H.
Normandy
Hook, R. M.
Rolla
Austin, J. S.
Bermel, P. F.
Broshot, A. E.
Bruno, E. W.
Butler, J. B.
Clark, M. W.
Crangle, D. E.
Elledge, W. C.
Eshbaugh, C. W.
Gleissner, M. J.
Gouchenour, E. W.
Greenwood, H. E.
Hall, H. S.
Harding, C. E.
Henningsen, J. N.
Johnston, H. M., Jr.
Kabiesh, H.
Kennedy, D.
Kimmick, E. J.
Lyon, P. C.
McClellan, M. C.
McCutchen, A. C.
Ransom, J. G.
Robison, L. B.
Rother, W. M.
Rydeen, J. P.
Shields, J. M.
Shumate, J. A.
Skordal, H. B.
Smith, J. F. W.
Taylor, I. G.
Tex, G. N.
Thompson, M. V.
Weishapple, C. E.
Williams, J. J.
St. Louis
Dale, R. E.
Dalton, D. V.
Deardorf, K. R.
Foster, C. C.
Gottsberger, J. B.
Hedden, R. T.
Lane, B. B., Jr.
Makar, O.
McLaughlin, T. J.
Rosenbaum, M. A.
Wagner, E. W.
Seligman
Collier, Miss S. E.
Warrensburg
Webb, J. A.

MONTANA—13

Belfry
Reichel, D.
Billings
Lillis, H. E.
Meadow, H. M.
Wilson, S. F.
Butte
McConnell, G. B.
Deer Lodge
Elliott, T.
Great Falls
Shepherd, G. L.
Hamilton
Dickson, G. M.
Hardin
Feild, R. W.
Havre
Possenti, S. J.
Libby
Miller, I. C.
Missoula
Peterson, V. R.
Troy
Ninneman, J.

NEBRASKA—2

Lincoln
Hazard, R. A.
Pender
Racely, W. A.

NEVADA—17

Carson City
Clock, F. F.
Criteser, G. B.
Henderson
Gould, F. J.
Las Vegas
Asher, J.
Bronken, K. T.
Brown, H.
Clary, E. H.
Goulette, J. D., Jr.
Leavitt, J. K.
Parvin, J.
Rathbun, F. D., Jr.

Snyder, D. S.
Tyson, L. E.
Wilson, E. D.

Reno
Curran, J. E.
McGirk, L. S., Jr.

Winnemucca
Huntington, J. G.

New Hampshire—10

Alstead
Chase, H.

Claremont
Breckenridge, W. F.

Dover
Davis, G. L.

Epping
Johnson, L. C.

Exeter
Matthews, C. M.

Hancock
King, H. T.

Nashua
Hyde, G. R.

North Charleston
Maynard, C. F.

Peterborough
Glazier, W. H. W.

Windham
Thorndike, R. W.

New Jersey—128

Barrington
Robertson, A. C.

Belle Mead
Bush, W.

Belvidere
Ryan, J. H.

Bernardsville
MacFadyen, K. A.

Boonton
Johnson, G. W., Jr.

Bridgeton
Huber, L. A.
King, G. M.

Clark-Rahway
Armstrong, R. E., Sr.

Cliffside Park
Rupp, C. F.

Clifton
Gardner, F. W.

Clinton
Studer, J. E.

Convent Station
Eckerson, S. J.

Cranford
Erickson, J. R.

Delanco
Ash, S. B.
Green, J. D.

Denville
DeLalla, O. T.

Dunellen
Fericy, R.

East Orange
Harvey, L. S.

East Rutherford
Oppleman, P.

Egg Harbor
Lloyd, H. C.

Fair Lawn
Canger, M. A., Jr.
Moroze, M. W.

Fanwood
Lowenhaupt, M. D.
Webster, W. O.

Franklin
Clarke, W. J

Freehold
DeGarmo, G. J.
McKee, L. K.

Hackettstown
Everetz, R. C.
Robson, R. H.

Haddonfield
Monroe, C. A.

Hawthorne
McDougall, D. R.

Highland Park
Palmer, D. W.

Hoboken
Bolter, W. H.
Costello, R. B.
Keuffel, C. W.

Jersey City
Clark, H. C.
Curley, J. P.
Hartman, H.

Keansburg
Landwehr, T. H.

Kearny
Swaim, C. H.

Kenvil
Pesce, F.

Keyport
Foss, F. A.

Lakewood
Fuller, J. W.
Larrabee, B. M.
Peters, S. B.
Waddill, G. B.

Livingston
Bockelman, C. W.

Manasquan
Frank, T. C.

Manville
Kachorsky, M. S.

Maplewood
Bruestle, J. H.
Robbins, J. M.

Merchantville
Gilman, C. G.

Metuchen
Buchanan, W. F.

Milford
Wean, E. L., Jr.

Millburn
Hillman, C. D.

Millville
Bartholomew, R. L.

Montclair
Deiller, H. E.

Montvale
Jost, R.

Morristown
Burrell, C. F.
Edwards, L. H.
Edwards, R. C.

Newark
Borrie, A. M.
Jones, W. R.
McDonald, F. H.
Michak, L.

New Brunswick
Bonus, E. A.
Moselowitz, H. G.
Wilson, R. P.

New Market
Kupper, C. J.
Sailor, S.

North Bergen
Montagne, L. D.

Nutley
Johnston, J. A.

Oakhurst
Postel, A. F.

Oakland
Oldenburg, J. W.

Orange
Bazzell, E. J.
D'Onofrio, M. D.
Hamilton, H. J.

Parsippany
Ahlers, T. H.
Mead, A. F., Jr.

Paterson
Chypak, J.
Levine, I.

Phillipsburg
Rice, P. P.

Plainfield
Langford, J. P.
Lewis, E. R.
Lewis, E. S.
Stillman, C.

Pompton Lakes
Millen, Mrs. M. G. B.

Princeton
Irish, S. B.
Kissam, P.
Noble, C. M.
Pranis, P. E.

Ridgefield Park
Boswell, D. C.
Ralston, H. J.

Ridgewood
Altman, F. J.

Rochelle Park
Von Dicke Schweser, E.

Rockaway
Collier, K.
Morrice, J. G.

Roselle
O'Hargan, P. T.

Scotch Plains
Curtis, C. B.
Muir, A., Jr.
Paff, H. L.

Sea Girt
Heyniger, P. W.

Somerville
Patrick, J. C.

South Amboy
Mitchell, T. F.

Summit
Keller, W. G.

Teaneck
Hartman, P.
Schwanewede, W. H.

Tenafly
Jorgensen, R.

Toms River
Platt, G. A.

Trenton
Blanchard, R. G.
Deininger, C. E.
Farrington, F. D. W., Jr.
Gruss, M.
Hutchins, J. F.
Stout, D. L.
Van Note, E. B.
Williams, E. A.

Upper Montclair
Winters, R. J.

Vineland
Bernard, A. E.

Wallington
Konikowski, E. G.

West Englewood
Koenig, E. H.

Wharton
Williams, C. A.

Wildwood Crest
Middleton, C. B.

Williamstown
McClennen, F. H.

Woodbury
McFarland, J. A.

Woodcliff Lake
Sielke, A. L.

Wood-Ridge
Bachelier, M. A.

Wyckoff
Kaeffer, C. D.

New Mexico—19

Albuquerque
Anderson, B. D.
Daniel, H. T.
Doak, C. C.
Elder, E. K.
Hutchins, E. J., Jr.
Koogle, H. G.
May, M. C.
McCallon, F. D.
Morrison, D. T.
Offield, J. F.
Torres, J. B

Artesia
Brown, J. H.

Elephant Butte
Jones, A. L.

Farmington
Amerman, R. W.

Las Cruces
Phillips, J. H., Jr.

Las Vegas
Beisman, H. E.

Los Alamos
Russo, S. E.

Los Lunas
Sandoval, P.

Portales
Schmieding, H. A.

New York—247

Albany
Davis, A T.
Gilbert, R. E.

Allaben
West, E. G.

Amityville
Hirsch, E.
Purdy, A. C.

Amsterdam
Cichonczyk, B.

Auburn
O'Neil, J. D.

Babylon
Birs, C. C.
Tompkins, H. C.
Weaver, D. A.

Baldwin
Hartman, F. C.

Batavia
Davis, D. H.

Bayport
Clement, R. L.

Bay Shore
Bartley, R. J.

Bayside
Browne, W. I.

Beacon
Hustis, G. R.

Bellmore
Jones, R. D., Jr.

Bellport
Weber, H.

Binghamton
Chape, B.
DeJean, C. L.
McFarland, W. H.
Shields, M. H.

Brooklyn
Dill, H.
Fahey, L.
Ludlam, R.
Peterson, J. M.
Soehngen, H. F.

Bronx
LaBanca, A. J.
McLaughlin, J. P.

Bronxville
Mathes, M. M.

Carle Place
Meyer, A.

Carmel
Burgess, R. A.

Chittenango
Smith, B. C.

Cobleskill
Snyder, F. E.

Copiague
Canalizo, H. R.

Corning
Ward, R. C.

Cuba
Holmes, H. F.

Deer Park
Evers, W. E.

DeWitt
Cooper, F. D.

Earlville
Rogers, D. W.

East Chatham
Kelleher, B. J.

East Hampton
Bass, G. H.

East Meadow
Debruin, W. E.
Glass, C. E.

East Syracuse
McGivern, R. F.

Edgemere
Bianco, A. A.

Elmira
Timbrell, W. B.

Fairport
Peet, O.

Farmingdale
Patrick, W. R.
Tufano, R.

Fayetteville
Lamprecht, J.

Floral Park
Smith, A. H. B.

Flushing
Christensen, A.

Gould, M.
Schenck, W. H.
Tchang, T.
Forest Hills
Comklin, R. F.
Stern, S. P.
Freeport
Baldwin, A. J. C.
Cornelius, J. D.
Emery, S. A.
Pope, W. J.
Garden City
Falkenbach, C. F.
Glen Cove
DeLorme, M. H.
Smith, C. Y.
Glen Falls
Lanfear, A. J.
Glen Head
Diggory, M. L.
Great Neck
Dodds, R. H.
Ward, C. E.
Greenport
Van Tuyl, O. W.
Hampton Bays
Squire, L. W.
Hastings-on-Hudson
Schwager, A. W.
Hempstead
Davidson, L.
Wirth, C. E.
Hilledale
Butler, R. W.
Hollis
Zamow, O. A.
Horseheads
Borst, F. E.
Weiler, J. D.
Huntington
Glassen, C. G.
Prime, T. S.
Inwood
Vandewater, W. H.
Islip
Belford, D. H., Jr.
Van Weele, P. J.
Ithaca
McNair, A. J.
Shu, Chi-San
Spry, F. J.
Tooles, C. W.
Underwood, P. H.
Jamaica
Clarke, C. G.
Schaff, T. E.
Shaw, A. D.
Jamestown
Findlay, D. S.
Peterson, H. N.
Kew Gardens
Miegel, I. A.
Liverpool
Wojcikowski, E. T.
Lockport
Hinton, C. J.
Long Island City
Hamber, F. C.
Rizzo, J. A.
Sanders, R. G.
Mahopac
Carpenter, C. W.
Malverne
DeVeaux, R. D.
Risso, J. J.
Steinbrenner, E.
Teas, H. J.
Manhasset
Meyer, W. H.
Peets, S. H.
Massapequa
Krummrich, F. V.
Lind, C. G.
Van Nostrand, H. A.
Merrick
Carman, M. B.
Malm, L.
Mexico
Hill, C. E.
Mineola
Ashley, A. N.
Cogliandro, R. J.
Weckerle, C. H.
Mount Kisko
Caldwell, J. S.
Carlson, C. H.
Mount Vernon
Cordes, H. A.
Newburgh
Martens, A. G.
New Hyde Park
Lindtvit, T.
New York & c/o P.M.
Allbright, W. J.
Barry, B. S.
Bellerue, V. L.
Belote, E. S.
Burney, I. M.
Camp, W. E.
Carpenter, J. C.
Cominetto, T. A.
Diercks, F. O.
Dorkovitch, V.
Eichler, J. O.
Gaussman, R. W.
Harbell, C. P.
Harrison, R. E.
Harwood, J.
Hatcher, W. E.
Hukhart, G., Jr.
Joos, C. J.
Krupa, M. S.
Laird, M. O.
Miller, O. M.
Norton, H. J.
Ober, C. H.
Pentland, L.
Porter, N.
Rabito, F. J.
Rosenzweig, N. A.
Schofield, C. O.
Wright, J. K.
Northport
Blydenburg, J. B.
Norwich
Kaler, B.
Tucker, H. A.
Nyack
Beardsley, W. D.
Oakland Gardens
Miller, E. L.
Oceanside
Bausch, C. E.
Olean
Austin, W.
Owego
Conlon, W. F.
Robertson, J. F.
Ozone Park
Dornhoefer, L.
Halbreich, H.
Schaefer, A.
Patchogue
Norton, N. C.
Pelletreau, J. R.
Roe, A. W.
Peekskill
Irish, J. W.
Plattsburg
Williams, N. T.
Port Jefferson
Hawkins, H. P.
Tuthill, H. T.
von Sauers, R. J.
Port Washington
Bartlett, H. N.
Caesar, A. M.
Potsdam
Cambridge, R. S.
Lundy, J. O.
Smith, T. S.
Willard, A. K.
Poughkeepsie
D'Luhosch, O. A.
Sutton, C. F.
Pulaski
Carnes, W. E.
Ravena
Timmers, W. W.
Rhinebeck
von Siegl, R. R.
Riverhead
Young, A. W.
Rochester
Foster, C. E.
Meyer, I.
Reynolds, K. E.
Rockville Centre
Fenton, J. V.
Voorhis, C. E.
Webster, J. S.
Rome
Brainard, A. R.
Zingerline, S. H.
Roosevelt
Wood, H. M.
Saint George, S.I.
Ettlinger, C. F.
Saranac Lake
Durgan, H. S.
Schenectady
Ganzler, A.
Male, C. T., Jr.
Sea Cliff
Butler, J. P.
Seaford
Loeffler, A. L.
Setauket
Wells, J. W.
Sherburne
Jury, H. L.
Shrub Oak
Moran, E. A.
Silver Creek
Knell, C. M.
Sodus
Braucher, S. L.
Staten Island
Crosson, R. E.
Wardlaw, G.
Stewart Manor
Hicks, W. T.
Syosset
Bartlett, F.
Hicks, A. J.
Syracuse
Faulds, A. H.
Garrow, J. H. P.
Gere, W. S.
Holmes, A. R.
Silvagio, P. M.
Stanton, B. T.
Tannersville
Allen, B. F.
Theresa
LaFave, A.
Troy
Champagne, R. G.
Hansen, J. W.
Harkness, D. H.
Higbee, L. C.
Kestner, J. A., Jr.
Knippel, P. R.
Mulhulland, R
Palmer, R. K.
Sharp, H. O.
Shaw, G. R.
Utica
Noble, A. G.
Valley Stream
Flick, J. T.
Henderson, B. M.
Wading River
Meier, W. G.
Wallkill
Wilkin, C. J.
Wantagh
Fitz, J.
McLean, L. K.
Warrensburg
Findley, L. S.
Watertown
Cooper, D. C.
Kerr, L. W.
Wellsville
Ackerman, M. C.
West Albany
Meyer, O. J., Jr.
Westbury
Baldwin, M. C.
Bohn, J. J.
Nelson, E. N.
West Chazy
Morris, R. J.
West Point
Schick, L. E.
White Plains
Carey, W.
Davatz, F. E.
Williamsville
Bissell, A. D., II
Wilson
Saggese, P. R.
Woodmere
Disher, Q. F.
Yonkers
Anderson, J. M.

North Carolina—40

Badin
Bisel, R. E.
Candler
Hutchison, F. L.
Charlotte
King, P.
Kirkman, B. E.
Stribling, J. N.
Council
Robbins, A. A., Sr.
Cullowhee
Turner, W. N.
Durham
Copley, J. W.
Elon College
McAdams, J. M.
Fayetteville
Cook, E. S., Jr.
Fuquay Springs
Russum, C. W.
Greensboro
Scott, R. F.
Walker, N. G.
Hertford
Cox, D., Jr.
Hickory
Jones, W. T.
Miller, R. F.
High Point
Dean, G. B.
Macon
Fitts, E. P.
Mocksville
Bowles, A. L.
New Bern
Martin, H. M.
Newton Grove
Bizzell, A. W.
Raleigh
Farmer, M.
Red Springs
McPhaul, E., Jr.
Roanoke Rapids
Pierce, H. T.
Waters, C. C.
Rocky Mount
Dasher, F. R.
Sanford
Eakes, J. C.
Shannon
Harrell, G. S.
Statesville
Cornacchione, T.
Stafford, W. R.
Tarboro
Wilson, R. F.
Trenton
Burt, J. R.
Troy
Furr, J. M., Jr.
Tryon
Frankenfield, H. B., Jr.
Wallace
Blanchard, W. W.
Waynesville
Cowart, T. C.
Wilmington
Hill, W. B., Jr.
Losak, G.
Wilson
Ellis, L. L.
Winnabow
Hewitt, H. R.

North Dakota—5

Dickinson
Veigel, L. W.
Enderlin
Golz, W.
Fargo
Mirgain, F. C.
Kenmare
Murphy, W. J.
Williston
Webster, W. W.

OHIO—157

Akron
Fish, R. C.
Hand, E. A.
Horner, F. H.
Kingsley, D. T.
McDonald, E. J.
Myers, B. R.
Swigart, S. T.
Ashtabula
Candela, J.
Athens
Ali, A.
Clark, G. W.
Bellaire
Jordan, L., Jr.
Berea
Thomson, J. M.
Bethel
Montgomery, S. E.
Bexley
Myers, A. O.
Bowling Green
Morgan, H.
Canton
Bessmer, D. A.
Markley, H. D.
McDermott, L. T.
Rodgers, M. A.
Sturrett, J. A.
Wilson, D. F.
Celina
Gebhart, B. R.
Chillicothe
Vinings, E. G.
Cincinnati
Brock, H. M.
Elliott, R. T.
Frolicher, H. E.
Gilcrest, B. R.
Kock, B. H.
Larson, E.
Neal, G. R.
Nunlist, P. F.
Pace, G. M.
Cleveland
Bauer, S. A.
Benke, S. H.
Braun, J. S.
Cyvas, V.
Earnest, G. B.
Gallimore, H. C.
Grinnell, W. P., Sr.
Gulla, C.
Hull, A. R.
Kelsey, R.
Kirlys, P.
Kouba, A. W.
Lander, W. P.
Lewandorf, S. C.
McSteen, J. E.
Mintzer, O. W.
Peterson, E. R.
Sanker, F. C.
Schmidt, E. L.
Stroebel, H. J.
Supp, C. W. A.
Cleveland Heights
Atkinson, A. C.
Columbus
Angwin, J. B. P.
Bare, B. K.
Case, J. B.
Doyle, F. J.
Flint, H. J.
George, R. E.
Harding, G. H.
Harvey, F. K.
Harvey, R. L.
Heiskanan, W. A.
Holmes, P. M.
Jury, H. L.
Kugel, F. O.
Loechler, L.
Patridge, R. T.
Rybski, V. A.
Schreiter, J. B.
Traini, F. P.
Wagstaff, R. R.
Watts, H. B.
Will, E. J.
Wood, R. V.
Coshocton
Boz, J. D.
Cuyahoga Falls
Arendt, J., Jr.
Marshall, C. C.
Dayton
Collins, C. V.
Gehrke, R. F.
Graves, D. J.
Gridley, J. F.
Keyes, J. A.
McClure, H. R.
Rosing, A. S.
Speer, H. E.
Willoughby, P. J.
Defiance
Leaders, J. E.
East Liverpool
Henry, W. H.
Euclid
Garnett, M. W.
Shields, H. M.
Fairview Park
Krause, R. H.
Gahanna
Evans, G. E.
Garfield Heights
Hawn, N. L.
Lakewood
King, H. J.
McElhany, S. S.
O'Brien, K. C.
Lima
Ash, C.
Lorain
Blair, E. F.
Kutza, D.
Williams, C. T.
Louisville
Vosler, R.
Marion
Tozzer, J. C.
Maumee
Barton, G. M.
Medina
Hood, T. J.
Mineral Ridge
Hughes, R. H.
Mount Vernon
White, F. L.
Navarre
Schneider, R. C.
New Carlisle
Mayer, G. P.
Norwalk
Starkey, D. E.
Orrville
Krichbaum, F. D.
Painesville
Fullerton, C. S.
Kerr, V. H.
Parma
Pesch, G. N.
Svoboda, L.
Peninsula
Fish, R. J.
Ravenna
Shafer, P. C.
Rocky River
Goebl, A. J.
Schneider, J. F.
Shaker Heights
Tyler, A. J.
Springfield
Eastman, R. F.
St. Clairsville
Ducheslove, W. A.
Henderson, T. J.
Steubenville
Crouch, H. G.
Jenkins, P. V.
Jones, T. J.
Loftus, T. S.
Strasser, W. C.
Stow
Stockman, W. J.
Toledo
Hill, W. S.
Hirst, F. T.
Linton, R. N.
Lyons, R. G.
Mayers, C. W.
Merkle, T. C.
Van Koughnet, W. N.
University Heights
Peterson, H. P.
Wadsworth
Blaney, F. J.
Flack, W. R.
Warren
Lynn, K. A.
Salak, J. P.
Washington, C. H.
Wagner, C. P.
Willoughby
Higgins, F. V.
Riley, F. N.
Wilmington
Borton, M.
Worthington
Turpin, R. D.
Wright-Patterson AFB
Ross, L. E., Jr.
Youngstown
Gould, S., Jr.
Hughes, R. H.
Krichbaum, E. F., Sr.
Rhoades, R. L.
Tuta, E. F.
Urey, C., Jr.
Zanesville
Kaplan, J. A.
Lewis, H. R., Sr.
Pinnick, R. B.

OKLAHOMA—17

Bartlesville
Bateman, H.
Caswell, E. C.
Engleman, H. K.
Pearson, R. R.
Cardin
Stroup, R. K.
Fort Sill
Gill, E. R.
Miami
Coulter, D. M.
Nowata
Meeks, W. R.
Oklahoma City
Edin, R. J.
Pauls Valley
Rennie, A. M.
Ponca City
Byrnes, C. J.
Stillwater
Comer, J. W.
Tulsa
Benish, A. A.
Bledsoe, C. C.
Collins, T.
Roberts, V.
Sheterom, V. E.

OREGON—34

Beaverton
Williams, V. S.
Corvallis
Starker, B.
Eugene
Chickering, H. G., Jr
Klamath Falls
Howard, F. Z.
Lakeview
Tyler, G. E.
Lebanon
Whitcomb, G. E.
Milwaukie
Barrett, E. W.
Oak Grove
Mason, B., Jr.
Oregon City
Milne, D. E.
Oswego
Paris, A. J., Jr.
Portland
Allan, D. R.
Boyd, M. J.
Gustafson, R. F.
Leaman, W. D.
Marx, D. E.
Miller, H. P.
Oros, C. N.
Pabst, V. H.
Schminky, H. B.
Smith, H. A.
Staats, H. R.
Tubbs, L. S.
Redmond
Mansfield, E. G.
Roseburg
Irving, B. B.
Salem
Barnes, R. G.
Beardsley, M. C.
Blair, J. W.
Clark, W. W.
Graham, A. D.
The Dalles
Cook, A. F.
Lamberson, R. E.
Tillamook
Carlich, J. L.
Waldport
Bragington, L. P.
Willamette
Dodge, H. F.

PENNSYLVANIA—120

Allentown
Bascom, W. B.
Kramlich, R. F.
Liebig, J. O., Jr.
Apollo
Wunderly, C. X.
Beaver Falls
Kronk, M. E.
Bethlehem
Bleckley, W. E., Jr.
Snyder, R. H.
Wiegner, A. N.
Breinigsville
Haas, A. M.
Bridgeport
Bramhall, E. A.
Bryn Athyn
Moorhead, D. T.
Bryn Mawr
Burlingame, G. M.
Butler
McMahon, T. E.
Camp Hill
Jones, Miss M. A.
Carnegie
Swiech, P. C.
Clarion
Taylor, L. S.
Collegeville
Meixner, H. F.
Columbia
Kirchner, C. R.
Conestoga
Bosley, W. H.
Feller, W. B.
Derry
Avampato, J. C.
Dillsburg
Miller, J. V.
Doylestown
Ritchie, W. D., Jr.
DuBois
Haag, E. I.
Easton
McNeal, J., 3rd
Elizabeth
Rothey, D. C.
Emmaus
Heffner, I. R.
Erie
Robinson, J. H.
Utterback, L. B.
Waldemarson, E. W.
Fairview
Weislogel, C. L.
Friedens
Kimmel, H. W.
Greentown
Schoenagel, F. C.
Hanover
Ehrhart, G.
Harrisburg
Fluent, C. H.
LeVan, D. R.
Patterson, J. A.
Holtwood
Cassell, F. B.
Loveland, W. P.
Homestead
Antalovich, J.

Hustontown
Malot, J. W.
Indiana
Playfoot, C. L.
Sokol, E.
Jackson
Kingsbury, E. T.
Jeannette
Beck, E. L.
Lancaster
Ritz, H. F.
Langhorne
Erwin, W. S.
Moon, C. H.
Levittown
Dingman, R. O.
Egan, J. F., Jr.
Mechanicsburg
Lowry, R. W.
Media
Dippy, R. N.
Houtman, G. D.
Middletown
Waltermyer, R. R.
New Cumberland
Brilthart, J. C.
Newtown Square
Doran, H. W.
Norristown
Schurr, D. H.
Singer, B. N.
Parkers Landing
McCall, J. S.
Perkasie
Hendricks, G. M.
Philadelphia
Abrams, L. N.
Alexander, E.
Altenedter, T. G.
Colen, P. M.
Dougherty, G. B.
Dupuy, E. P.
Feder, L. A.
Fleischman, V.
Gomolka, E.
Greer, R. C.
Kauffman, V.
Knight, H. S.
Kreisman, A. J.
Levinson, C. E.
Patterson, M. B.
Perkins, B. C.
Richter, H. F.
Sciambi, B. E.
Smith, R. H.
Storms, C. E.
Turner, A. W.
Yates, S.
Zmakow, A.
Pittsburgh
Aires, B. H.
Cummings, R. A., Jr.
Ferguson, R. C.
Heller, W. M.
Kerr, J. J.
Nemmer, J.
Scott, J. L.
Smith, J. A.
Smith, T. S.
Point Marion
Cubbage, J. M.
Port Allegany
Lovell, C. V.
Reading
Angstadt, O.
Ridgway
Gifford, C. K.
Rochester
Baker, M., Jr.
Miller, C. L.
Warnick, D. A.
Sayre
Jones, G. K.
Schuylkill Haven
Butz, G. W.
Shamokin
Yocum, W.
Somerset
Neilan, F. G.
Springfield
Damon, H. G., Jr.
Fox, G. J., Jr.
State College
Kulhan, E. F.
Perez, L.
Weeden, H. A.
Stroudsburg
Aicher, J. B.
Thompson
La Barre, L. L.
Trevose
Corts, H. T.
Upper Darby
Kline, O. E.
Verona
Brush, D. V.
Washington Crossing
Niven, W. O.
Park, J. G.
West Chester
White, H. R.
West Newton
Stevenson, A. M.
Windber
Kerschner, E. R.
Wyncote
Quinn, A. O.
York
Davidson, D. M.

PUERTO RICO—8

Mayaguez
Matilla, A.
Sollins, A. D.
Rio Piedras
Barea, S.
Sosa, M. W. R.
Santurce
Deliz, H. A.
Hernandez, A. M.
Mercado, Z. M.
Rublio, E. G.

RHODE ISLAND—8

Anthony
Matteson, R. C.
Edgewood
Holburn, A. E., Jr.
North Providence
Paiano, M. A.
Providence
Suddard, A. W.
Riverside
Geisser, R. F.
Valley Falls
Curtis, W. D.
West Kingston
Moultrop, K.
Woonsocket
Bibeault, G. B.

SOUTH CAROLINA—24

Aiden
Toole, S. P.
Anderson
Divver, W. T.
Robinson, D. H.
Beaufort
Parker, H. M.
Sammons, J. C.
Camden
Oliver, H. R.
Charleston
Key, J. C.
Charleston Heights
Matheny, W. H.
Clemson
Scaife, W. M.
Columbia
Hampton, A. G.
Eau Claire
Strait, J. F., Sr.
Georgetown
Hamilton, L.
Greenville
Bleckley, K.
Crouch, A. C.
Dawsey, C. B.
Greenwood
Ethridge, E. S.
Leesville
Hallman, J. O.
North Augusta
Grant, J. L.
Rock Hill
White, W. C.
Spartanburg
Gooch, J. H.
Sumter
Malone, R. L.
Palmer, C. P.
Russell, A. P.
Walterboro
Fripp, H. M.

SOUTH DAKOTA—2

Edgemont
Peter, P. W.
Yankton
Poulsen, H. R.

TENNESSEE—27

Chattanooga
Betts, C. A.
Curtis, R. V.
Dittmer, R. S.
Frierson, R. E.
Holmes, B. O.
Loomis, F. S.
Massa, W. S.
Miles, W. P.
Moore, R. L.
Morris, P.
Prigmore, W. A., Jr.
Soehle, B. L.
Tytula, J. B.
Dayton
Uzefovich, A. M.
Knoxville
Aikin, H. B.
Halliburton, E. A.
McDonald, J. E.
Parker, C. O.
Tylor, R. R.
Memphis
Newman, J. R.
Morristown
Thomas, M. C.
Murfreesboro
Kerr, J. D.
Smith, A. M.
Nashville
Migay, V. V.
Robinson, R. W.
Sullivan, J. M.
Winchester
Lunsford, J. D.

TEXAS—331

Abilene
Oglesby, A. R.
Alice
Embry, W. S.
Anahuac
Hall, R. L.
Limerick, D. B.
Pinchback, R. T., Jr.
Angleton
Buenger, C. M.
Munson, H. W.
Smith, H. D.
Walsh, W. C.
Argyle
Sheffield, J. G.
Arlington
Breen, E. I.
DiSiullo, O. V.
Austin
Barclay, L.
Freeman, J. D.
Morriss, G. C.
Watson, J. T.
Bay City
Polson, R. D.
Rother, J. F.
Baytown
Ehrhardt, W. E.
Kelley, R. W., Jr.
Milner, J. F.
Beaumont
Bills, S. E.
Cruise, R. B.
Howell, B. J.
Kohler, C. A.
Lindow, C. G.
Norris, L. V.
Patton, J. L.
Roy, R. T.
Schaumburg, G. J.
Spiller, H. B.
Stonecipher, G. A.
Tetley, W. R.
Thurman, J. E.
Welborn, M.
Bellaire
Britain, K. E.
Chelf, H. J.
Croley, J. M.
Earnest, L. H., Jr.
Gold, K. G.
Harris, G. E.
Harris, L. W.
Iwers, H. D. L.
McKnight, J. G.
Read, R. L.
Thompson, C. A.
Big Spring
Baker, R. W.
Breckenridge
Mobley, T. P.
Cleburne
Adams, L. M.
Conroe
Waddill, J. P.
Corpus Christi
Blucher, C. M.
Gerber, R. G.
Green, W. W.
McMullen, W. H.
Sinclair, F.
Corrigan
Herzik, A., Jr.
Crawford
Baker, R. J.
Dallas
Arrington, W. D.
Belcher, W. R.
Berkley, F. L.
Boot, G. W.
Burkart, W. J.
Clark, A.
Fleming, L. C.
Groves, M. B.
Howard, D. C.
McCarty, M. D.
McMahon, R. J.
Pennington, D. E
Rhodes, C. L.
Robinson, W. B.
Smith, S. G.
Todd, R. W.
Watts, R. G.
Williams, D. E.
Damon
Mott, L. B., Jr.
Eagle Lake
Davidson, F. N.
Edinburg
Melden, C. L.
El Paso
Cook, F. S.
Miller, C. E.
Mobley, R. L.
Quay, J. H.
Schaffer, J. F.
Floydada
Newell, W. D.
Fort Worth
Baker, J. F.
Black, R. L.
Dve, L. A.
French, J. E.
Hawkins, L. M.
Rounds, W. A.
Webb, I. H.
Galveston
Cabaness, T. L.
Lowery, L. L.
George West
Striebeck, W. H., Jr.
Goldthwaite
Gantt, J. C.
Graham
Mobley, W. G.
Grand Prairie
Garrett, B. S.
Groesbeck
Leach, W. W.
Houston
Ackerman, W. H.
Adams, D. H.
Adams, R.

Akkerman, W. H.
Armstrong, C. T.
Atkinson, E. S.
Atkinson, R. M.
Baber, W. H., Jr.
Barker, C. H.
Bassinger, W. E.
Baucum, W. A.
Beatty, A.
Bergeron, G. D., Jr.
Berry, D.
Biddulph, W. C.
Boddeker, R. E.
Boenker, A. C.
Boyles, J. S.
Brandt, E. D.
Brownlee, J. H.
Buford, R. R.
Bush, H. E., Jr.
Butler, E. S.
Carnes, A. L.
Carr, L. P.
Castille, W. A.
Champion, D. F.
Cornitius, L. E.
Coulson, B.
Crosser, R. E.
Dailing, L. J.
Daley, R. K.
Daniell, W. F.
Davis, A. L.
DeValcourt, W. T., Jr.
Dillon, T.
Dornier, F. L., Jr.
Duke, R. E.
Durham, J. H.
Edwards, L. E.
Ehman, J. D.
Elson, T.
Ewing, J. C.
Ferguson, J. L.
Fisher, C. W.
Fisher, H. B.
Flowers, C. C.
Fones, W.
Foster, C. J.
Fox, R. L.
Frederick, J. F.
Gallenkamp, E. H.
Geller, W. C.
Hall, B.
Heaney, H. J.
Heitzman, E. M.
Herzog, G. W.
Hicks, J. A., Jr.
Hoffman, W. H.
Isaacks, E., Jr.
James, C. A.
Jarrell, W. A.
Johnson, H. J.
Jordan, R. A., Jr.
King, C. E.
Kingsland, L. M.
Kirkland, E. H.
Kornmayer, T. J., Jr.
Kraus, V. K.
Kropet, H. J.
Kupec, P. O.
Lacy, G. H.
Ladas, B. J.
Lanclos, L. M.
Lipscomb, J. C.
Lloyd, D. I.
Lozano, M.
Maidlow, D. K.
Mason, H. E.
McClure, C. E.
McCoy, J. V.
McKinnon, C. R.
McKnight, C. P.
McLaren, J. M.
Meriwether, G. B.
Metyko, F. J.
Milam, H. H.
Miller, A. B.
Miller, B.
Miller, E. L.
Mills, J. M.
Mitchell, L. O.
Montgomery, C. J., Jr.
Moreland, H. H.
Morse, E. D.
Musselman, G. E.
Nelson, J. E.
Newsom, W. A.
Newsome, R. C.
Oberg, S. W.
Orchard, R.
Osborne, C. W.
Payne, J.
Pearson, E. G.
Pearson, F.
Perry, I. W.
Phillips, J. O.
Powell, P. B.
Rains, L. J.
Ray, R. H.
Reid, R. L.
Reneau, G. B.
Rice, E. E.
Roberson, R.
Roten, G. A.
Rowland, W. G.
Russell, H. T.
Sargent, R. L.
Savage, F. D.
Schroll, C. L.
Seiford, R. E.
Sellers, J. B.
Shands, W. O., Jr.
Shaner, R. C.
Sharpe, L.
Shelton, A. C.
Siever, R. W.
Smith, B.
Smith, L. A.
Smith, W. R.
Sparks, R. G. B.
Spurlock, T. W.
Stallworth, D. C.
Still, B. I.
Stimson, A. C.
Stramler, J. W.
Striekert, H. F.
Striekert, R. R.
Sullivan, W. F.
Tasker, A. D.
Taylor, H. C.
Thornton, S. E.
Tomlinson, J. A.
Wall, V. R., Sr.
Wallace, W. E.
Walston, V. A.
Warfield, W. F.
Warren, W. J.
Washburn, R. A.
Watson, P. L.
Webb, C. J.
West, H. L.
White, A.
White, W. K.
Wildman, C. M.
Willett, L. C.
Wilson, C. M.
Wilson, L. J.
Wilson, S. F.
Wilson, W. H.
Wiseman, P. W.
Yarberry, H.
Young, A. L.
Young, O. E.
Zingery, W. W.
Zube, A. B.

Jasper
Mayberry, J. D.

Jourdanton
Cobb, D. C.

Kemah
Graham, J. K.

Kenedy
Klumpp, C., Jr.

Kirbyville
Miller, J. P., Jr.

Lake Jackson
Cooper, H. P.

Liberty
Bruce, R .H.
Partlow, R. G., Jr.

Livingston
Coats, S. T.
Walters, P. M.

Lone Star
Clements, J. M.

Longview
Thompson, P.

Marfa
Daniels, R. E.
Thee, N. M.

McAllen
Roberts, J. G.

Mesquite
Sterling, E. F.

Midland
Moncrief, L. H.
Westerfeld, W. S.

Mineola
Burnett, E.

Missouri City
Drew, C. D.

Mount Pleasant
Burton, W. A.

Munday
Jackson, L. O.

Odessa
Spry, M. E.

Pampa
Thompson, G. W.

Pasadena
Moore, A. B.

Pearsall
Schorp, F. J.

Plainview
Williams, W. J.

Price
Wood, H. D.

Refugio
Young, P. G.

Rio Grande City
May, J. H.

Robstown
Herold, L. J.

Rockport
Jarboe, J. A.

San Angelo
George, H. L.
Williams, D. L.

San Antonio
Ammann, J.
Boothe, Z. J., Jr.
Brown, H
Chang, W
Connor, A. B.
Drought, F. T.
Ferguson, M. L.
Flowers, G. W.
Grothaus, F. E.
Hazard, T. A.
Ingram, J. J.
Mimms, W. L.
Potter, J. E.
Seran, H. A.
Slocum, R. G.
Thayer, G. E.
Webber, K. R.
Woodward, L. A.
Wright, M. S., Jr.

Sinton
King, R. S.

Temple
Williamson, F.

Texarkana
McIver, H. M.

Tyler
Cowan, J.
Hilton, T. E.
Hudnall, J. S.
Hughes, R. H.
Smith, F. D.

Vernon
Biggs, J. E., Jr.

Victoria
Ford, D. G.

Waco
Jahn, W. H.
Koos, N.
Uran, C. H.

Wharton
King, B. D., Jr.

UTAH—12

Glendale
Bauwens, G. O.

Ogden
Greenhalgh, R. L.
Morrison, L. J.

Salt Lake City
Adams, T. C.
Ahearn, J. M.
James, L. B.
Kindred, I. S.
Larson, L. A.
Petersen, L. M.
Scott, F. H.
Wood, R. M.
Woolley, G. B.

VERMONT—7

Barton
Kambour, T.

Burlington
Root, J. A.

Montpelier
Baker, E. F.
Carr, R. W.
Purchase, A. R.

Rutland
Keefe, C. B.
McCammon, R. L.

VIRGINIA—229

Abingdon
Cumbow, A. L., Jr.

Accomac
Gibb, J. B.

Alexandria
Bowersox, G. R.
Brunswick, C. E.
Causey, Mrs. B. H. M.
Cross, C. J.
Cude, W. C.
Cutler, M. L.
Dodd, O. E.
Durkin, J. J.
Edmonston, H. R.
French, R. J.
Gearhart, J. E.
Holland, E. S.
Johnson, Q. S.
Kaula, W. M.
Kennedy, T. J., Jr.
Kraft, K. C.
Kursch, R. F.
Lorenz, G. G.
Neal, J. M.
Richardson, J. R.
Ridgeway, W. N.
Stirni, A. R.
Streeter, G. H.
Ullom, M. R.

Annandale
Ghent, V. H.
McLaughlin, M. F.
Willey, G. B.

Arlington
Abraham, N. N.
Ackerson, C. H.
Altenhofen, R. E.
Amstadt, J. M.
Arneson, C. L.
Bailey, J. K.
Burthold, E.
Birdseye, S. H.
Blankenbaker, F. F.
Bodemer, P. E.
Bon Durant, E. V.
Britt, W. S.
Brubaker, J. I.
Bruder, W. A.
Bullard, E. F.
Bussell, C. T.
Cameron, T. F.
Carlisle, C. V.
Caulfield, S. J.
Chewning, M. R.
Chute, G. L.
Chute, K. M.
Collier, M. L.
Copeland, F. E.
Corn, L. H.
Crowther, G.
Custidero, L. R.
Darnell, R. C.
Dobbins, J. D.
Dodd, A. B.
Eckelmann, G. F.
Elder, W. C.
Elkins, F. S.
Garner, L. C., Jr.
Gerster, G. F.
Gilchrist, C. F.

Gilman, C. R.
Grunwell, G. B.
Hall, E.
Hallmark, N. T.
Hamke, R. F.
Hand, S. P.
Haseltine, R. H.
Higginson, W. S.
Hollcroft, P. E.
Housman, B.
Krahmer, E. A.
LaMont, R. E.
Landen, D.
Law, J. A.
Lee, R. O.
Leida, C. F.
Luckus, J. W.
Lyddan, R. H.
Mager, C., Jr.
Maher, D. M.
Maki, K. N.
Mangan, G. B.
Marsden, L. E.
Marshall, J.
Marshall, R. B.
Mattingly, J. A.
Mattingly, S. E.
McCarthy, E. R.
McDermith, H.
McMillen, H. J.
Miller, C. I.
Miller, H. J.
Miner, E. O.
Mitchell, Mrs. M. H.
Moravetz, R. L.
Murphy, C. F.
Myers, C. R.
Neary, F. B.
Nottage, C. W.
Ortiz, F. J.
Paine, R. H.
Patten, F. E., Jr.
Payne, J. D.
Perkins, E. W.
Phillips, W. M.
Poling, M. Y.
Pryor, W. T.
Reading, O. S.
Reamer, C. A.
Rodgers, R. E.
Rogers, E. C.
Sayer, R. E.
Simmons, H. E.
Simmons, L. G.
Smith, P. A.
Spencer, W. H.
Sprenkel, J. B.
Striker, A. F.
Swift, C. E.
Tanner, C. H., Jr.
Thatcher, E. J.
Trethow, A. K.
Van Brunt, E. E.
Van Camp, C. P.
Vaughan, R. W.
Watkins, J. L.
Webb, H. R.
Webb, J. P.
Westinghouse, G. F.
Wigglesworth, J. R.
Williams, H.
Wright, M. S., Sr.
Zahn, F. H.
Zavis, A.

Bedford
Patterson, J. L.

Blacksburg
Brinker, R. C.
Smith, D. V.

Cambria
Jennelle, E. M.

Chase City
Willis, C. O.

Chincoteague
Gillespie, W. J.

Christiansburg
Clements, E. S., Jr.

Clarendon
Buckey, C. W.

Crozet
McNair, J. W., Jr.

Culpeper
Boldridge, J.

Dinwiddie
Butterworth, H. L.
Chappell, W. G.

Dunn Loring
Streiffer, J. J.

Fairfax
Brew, A. N.
Bryan, D. F.
Gleason, W. B.
Massey, G. H.
Ralph, W. L.
Southard, R. B., Jr.
Stoneman, W. G.
Wright, H. O., Jr.

Falls Church
Anderson, T. D.
Anson, A.
Berry, W. E.
Blackwell, W. H., Jr.
Coats, K. W.
Gordon, A. R.
Greenawalt, N. E.
Gribok, P.
Henry, W. T.
Hughes, T. A.
Munson, A. T.
Palmer, C. B.
Peckinpaugh, C. L., Jr.
Perry, C. H.
Phillips, W. L.
Poling, A. A., Jr.
Ramey, E. H.
Romig, W. W.
Smith, L. R.
Thorpe, C. A., Jr.

Farmville
Hurt, J. H.

Fort Belvoir
Galluccl, A. D.
McComas, H. O.
Pennington, J. T.
Stukhart, G., Jr.

Fort Norfolk
Miller, S. W., Jr.

Fredericksburg
Harris, J. P., Jr.

Grundy
Belcher, C. B.

Hampton
Hastings, C. E.

Hopewell
Whipp, W. S.

Lexington
Clark, B. X., Jr.

London Bridge
Walker, W. L.

Manassas
Ratcliffe, R. J.

Martinsville
Brown, W. C.

McLean
Kingman, Mrs. M. M.
Maxson, R. O.
Small, J. B.
Voskull, R. J.

Newport News
Lyons, W. A.
Murray, F. R.

Norfolk
Bainbridge, W. H.
Bamforth, C. A.
Bartee, J. H.
Boush, G. W.
Browne, J. J., Jr.
Cherry, A. L.
Freeman, P. D.
Mason, J. A., Jr.
Seaborg, H. J.

Onancock
Watson, C. W.

Richmond
Allnutt, W. M.
Foster & Miller
Harwood, J. E.
Mudd, T. T.
Parrish, G. J.
Richwine, M. W., Jr.

Rocky Mount
Moses, J. G.

Springfield
Dourson, H. L.
Hardy, R. L.
Hellwig, C. H.
Hellwig, G. W.

Staunton
Crawford, W. A.

Vienna
Baldwin, R. S.

Warrenton
Bartenstein, J. H.
Bartenstein, R. M.

Waverly
Carpenter, L. B.

West Point
Highland, R. H.

Williamsburg
Carter, R. V.

Winchester
Goode, R. U.

Virgin Islands—1

St. Thomas
George, F. C.

Washington—56

Aberdeen
Harpster, R. A.

Bellevue
Bessor, P.
Jones, R. W.

Edmonds
Meyring, M. B.
Middleton, L. F.

Eltopia
Noble, P. M.

Inchelium
Lamoreaux, H. G.

Kennewick
Nutley, V. E.
Worley, C. T.

Kent
Drake, F. M.

Long Beach
Snyder, M.

Longview
Miller, O. R.

Mesa
Tiffany, R. K., Jr.

Olympia
Thurmond, J. W.

Oroville
Weaver, S. M.

Port Angeles
Wright, J. U.

Pullman
Welch, F. W.

Renton
Storey, R. J.

Seahurst
McDuffee, J.

Seattle
Berry, C. M.
Birnbaum, H.
Bush, Y.
Chittenden, H. M.
Clark, C. W.
Colcord, J. E.
Dennis, H. D.
Fisher, R. R.
Haines, D. H.
Hanson, A.
Haselwood, R. W.
Hayes, J. B.
Helm, L.
Hitchings, A.
Hoag, A. L.
Jeffers, K. B.
Johnson, J. O.
Nelson, G. A.
Parrott, W., Jr.
Richards, E. W.
Schanck, C. A.
Sobieralski, V. R.
Stahl, C. B.
Thorson, A. C.
Waller, H. H.
Weiss, C.
White, T. C.
Williams, P. A.
Willumsen, O. S.

Shelton
Snelgrove, F.

South Bend
Edwards, M. B.
Runge, H. L.

Spokane
Bentz, A. H.
Payne, C. V.

Sunnyside
Billington, J. C.

Tacoma
Snyder, W. S., Jr.

Walla Walla
Gee, D. J.

West Virginia—8

Bluefield
Schrinner, W. P.

Charleston
Hubbs, G. L.
Turner, W. H.

Clarksburg
Scharper, J. E.

Huntington
Frank, J. E.
Neel, T. D.

Morgantown
Baker, W. H.

Princeton
Gay, H. C.

Wisconsin—45

Beaver Dam
Lange, J. H.

Beloit
Batterman, R. H., Jr.

Cedarburg
Eide, J. A.

Clintonville
Pelishek, R. P.

Crivitz
Gould, F. P.

Cudahy
Hay, R. N.

Elkhart Lake
Laun, L. L., Jr.

Fond du Lac
Diedrich, L. J.
Vollstedt, J. H.

Fort Atkinson
Fuge, K. W.

Green Bay
Hall, R. D.
Hintz, D. A.
Rollman, C. W.

Juneau
Nelson, H. L.

Kenosha
Godlewski, K.
Smith, R. L.

Madison
Corbin, J. P.
Mueller, R. W.
Robinson, A. H.
Wagner, E. C.
Williams, H. F.

Manitowoc
Groll, A. C.
Mecha, R. B.

Milwaukee
Bauer, K. W.
Fassett, R. W.
Kinnel, B.
Kirchman, E. A.
Peterson, R. A.
Piepenburg, C. H.
Schlagheck, K. J.
Schmidt, M. H.
Webster, D. W.
White Company, David
Willis, J. E.

Minocqua
Kowalke, E. F.

Neshkoro
Phillips, F. J.

Oconto
Mueller, R. W.

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Cosmic-Ray Map of the World

An announcement made this summer by the National Geographic Society revealed plans for a cosmic-ray map of the world. As a part of this project, the Swedish merchantman *M. S. Lommaren* was scheduled to sail early in September from Goteborg, Sweden, to begin a series of observations which will extend through the period of the International Geophysical Year.

The *M. S. Lommaren,* with Cape Town as its first scheduled port of call, will carry a three-ton cosmic-ray monitor constructed at the Bartol Research Foundation with help from National Science Foundation and the Office of Naval Research. Dr. Martin A. Pomerantz, a veteran of other cosmic-ray expeditions, supervised the installation of the equipment aboard the floating observatory.

The data obtained from the observations to be made aboard ship will be correlated with data already obtained at stations located on mountains, in balloons, in airplanes, and even in rockets, to produce eventually the first cosmic-ray map of the world.

The shipboard project is under the joint sponsorship of the National Geographic Society and the Bartol Research Foundation of the Franklin Institute in collaboration with the National Research Council of Canada, the Physics Institute of Uppsala University, and the Tranatlantic Company of Sweden.

The proposed map may prove useful to future travelers in space as well as to the transportation and communications systems of the present.

International cooperation on scientific projects, such as the many scheduled for the International Geophysical Year, is the key which is gradually unlocking, one after another, the multitude of chests in which Earth's secrets are locked.

Louisiana Section

The Louisiana Section of the American Congress on Surveying and Mapping assembled for its regular quarterly session on July 9, 1956, in the Engineers' Club, DeSoto Hotel, New Orleans, La.

Chairman Martin Standard called the meeting of 40 members to order at 8:00 p.m., and announced the formation of a Membership Committee with Ashton Laborde as chairman.

S. P. Chapman, Chairman of the Program Committee, introduced Admiral Lewis N. Moeller, U. S. Navy, Retired, as the featured speaker of the evening. Admiral Moeller spoke on the "Engineering and Surveying of the Acadian Throughway." Admiral Moeller was in charge of the surveying on this 78-mile proposed roadway, and his talk on the difficulties encountered on the project and the engineering and surveying techniques employed to overcome those difficulties was highly informative.

Following Admiral Moeller's talk, two films of general interest were shown. The first, entitled "Historic Boundary of Louisiana," was narrated by Judge Leander Perez. The second film was entitled "History of the Helicopter."

—ROBERT BAKER, JR.
Section Editor

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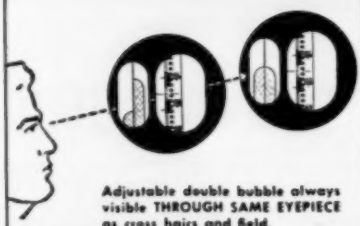

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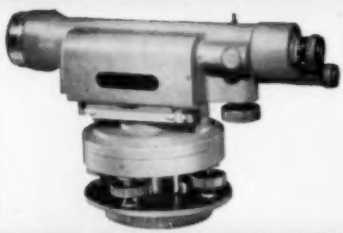

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Bibliographie Cartographique Internationale

The seventh edition [1956] of the *Bibliographie Cartographique Internationale,* listing map publications for the year 1954, was recently issued by Armand Colin of Paris. The *B.C.I.,* first published in 1949, with listings for the years 1946 and 1947, is compiled under the joint auspices of the French National Committee on Geography and the International Geographical Union, with the collaboration of UNESCO and the National Scientific Research Center of France. Co-editors of the *Bibliographie* are Mlle. Myriem Foncin, Curator of Maps at the Bibliotheque Nationale, Paris, and Mlle. P. R. Sommer, Librarian of the Institute of Geography, University of Paris.

The 1956 edition includes maps published in twenty-one countries, one more than had listings in the previous volume. Mexico is the newcomer to the growing list of contributors to this valuable and useful international bibliography of maps. Listings for the United States are compiled by staff members of the Library of Congress, Map Division.

The seventh edition of the *Bibliographie* lists more than 2,100 maps, a slight decrease over the previous year. This is accounted for by a decrease in the number of separate maps in most countries, although the number of new and revised sheets of official map series have increased. Inasmuch as separate maps are, for the most part, published by private individuals and commercial concerns, this emphasizes the increasing domination of map publishing by official governmental agencies. The *Bibliographie* includes a useful index listing some 1,500 map publishers, with full street addessses for many.

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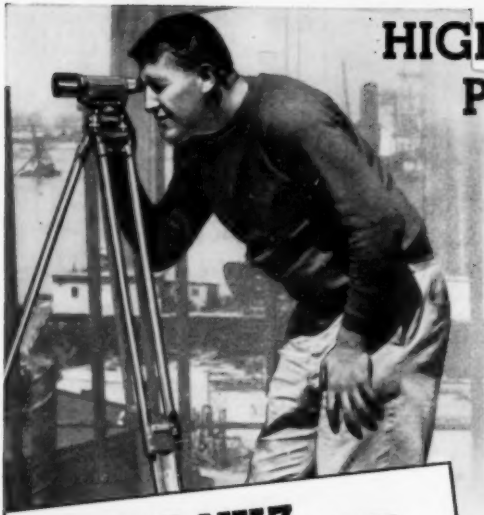

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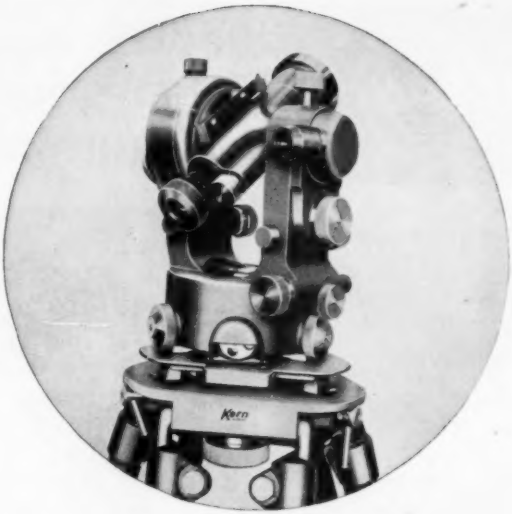

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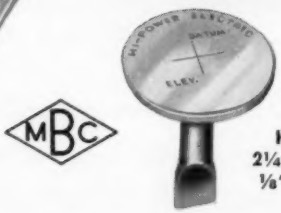

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On June 28, 1956, in the Senate of the United States, a Bill (S. 4136) was introduced to authorize the issuance of a special series of stamps as a tribute to the surveyors of the United States. The Bill was introduced by Senator Johnson of Texas for Senator Daniel of Texas. It was read twice, as follows, and referred to the Committee on Post Office and Civil Service, of the 84th Congress, 2nd Session.

A BILL

To authorize the issuance of a special series of stamps as a tribute to the surveyors of the United States.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Postmaster General is authorized and directed to prepare for issuance, on as early a date as practicable, a special series of postage stamps, of such appropriate design and of such denomination as he shall prescribe, as a tribute to the surveyors of the United States for invaluable services rendered by them in the development of the United States.

Stuart J. Boyles, Chairman of the Commemorative Stamp Committee and the Texas Section of ACSM, who spearheaded the drive, are to be congratulated for successful progress to date in bringing action this far. Despite the fact that due to closing of the 84th Congress the Bill will become inactive in committee, they are urged to continue the spirited drive with vigor to again introduce it to the 85th Congress. In this, surveyors everywhere are urged to get behind this drive and let their respective Congressmen know how they feel about it.

1957 ASP–ACSM CONSECUTIVE MEETINGS AND CO-EXHIBIT
March 3–9, 1957, Washington, D. C.

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Personals

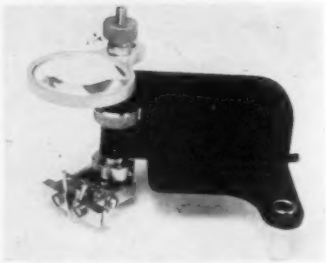
Dr. **Arch C. Gerlach,** Chief of the Map Division, Library of Congress, has been elected a Director of the Special Libraries Association to serve for a three-year term. Dr. Gerlach has been active in the map field since 1942 when he served in the Map Division of the O.S.S. Following the war he was in the Map Division of the Department of State. From 1946–1950 he taught geography at the University of Wisconsin.

Captain **Riley J. Sipe** retired from the Coast and Geodetic Survey June 30, 1956, after serving with that Bureau for nearly 32 years. A graduate of the University of Michigan, Captain Sipe entered on duty with the Survey in 1924. His service during the past 32 years has carried him over a large part of the world, Alaska, the Philippines, and Liberia. For nearly three years before his retirement Captain Sipe was Director of the Liberian Cartographic Service, a cooperative undertaking supported by the Coast and Geodetic Survey. Captain Sipe saw service in both World Wars—in World War I in France with the 116th Engineers and in World War II with the Air Force. He holds the Air Medal, the American Campaign Medal, and the Asiatic Pacific Campaign Medal with one Bronze Star.

Captain **Edward R. McCarthy** retired from the Coast and Geodetic Survey June 30, 1956, after 31 years service with the Bureau. After graduation from Tufts College he entered the service of the Coast and Geodetic Survey in July 1925. His various assignments have taken him to Alaska, Hawaii, and the Philippines. During World War II, he served with the Corps of Engineers in the Algeria-French Moroco, Tunisia, Naples-Foggia, Rome-Arno, Rhineland and Central Europe campaigns. He was awarded the Legion of Merit, Army Commendation Medal, and the Bronze Star Medal. He was, at the time of his retirement, promoted to the rank of Rear Admiral. His postwar assignments have included many of importance with relation to both nautical and aeronautical charting.

Rear Admiral **H. Arnold Karo,** Director, U. S. Coast and Geodetic Survey, is now first vice-president of the Society of American Military Engineers.

UNI-GRAVER



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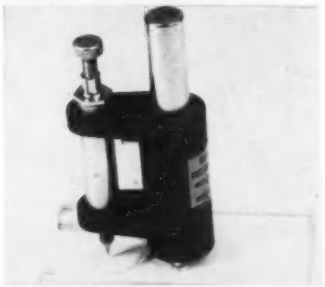

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Dr. **Weikko A. Heiskanen,** Director of the Institute of Geodesy, Photogrammetry, and Cartography at Ohio State University was recently awarded an honorary doctoral degree by the University of Bonn.

In June 1956, **Newman Bumstead** completed 25 years of service with the National Geographic Society. He is now Assistant Chief Cartographer for the Society and is following in his father's footsteps, his father having been the first Chief Cartographer for the N. G. S.

Col. **Alfred M. Eschbach,** formerly Director, Department of Topography, Engineer School, Fort Belvoir, has been reassigned to be Post Engineer for Fort Belvoir and the Engineering Center. Col. George E. Pickett, formerly Post Engineer, has been assigned to the Civil Works Division, Office of the Chief of Engineers, Washington, D. C.

Robert H. Lyddan, Assistant Director of the U. S. Geological Survey and a member of the Board of Directors of ACSM, has been appointed as the representative of ACSM on the National Research Council Division of Earth Sciences. He takes the place formerly held by Admiral **H. Arnold Karo,** whose term of Office expired June 30, 1956.

Marshall S. Wright, Sr., a former president of ACSM and now one of its honorary members, was designated the official representative of ACSM at the VIII International Congress of Photogrammetry at Stockholm.

Helmuth Bay has been appointed chairman of the recently-activated Public Relations Committee of the American Congress on Surveying and Mapping.

Carl W. Keuffel, received the 1956 citizen award of the New Jersey Society of Professional Engineers for "outstanding achievement in industrial statesmanship and the humanities and his everlasting endowment to public health safety and welfare."

Admiral **H. Arnold Karo,** Director, Coast and Geodetic Survey, has been appointed a member of the Mississippi River Commission.

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ASP MOVES TO NEW HEADQUARTERS

Effective July 1, 1956, the American Society of Photogrammetry has announced the moving of its headquarters offices to new quarters in the new building erected by the American Association for the Advancement of Science at 1515 Massachusetts Avenue, N.W., Washington 5, D. C.

SPARTAN FLYS OVER INDIA

Flying of a 10,000-mile airborne-magnetometer survey in the Ganges Basin, India, started "last month" as a part of Canada's contribution to the Colombo Plan, was announced May 30, 1956, in Ottawa by officials of Spartan Air Services Limited. This survey, which is an extension of a survey covering 20,000 square miles in the West Rajasthan desert, is designed to speed India's search for oil.

FROM THE MAILBAG

"I don't know of any place that so much good is obtained from so little a financial investment as membership in this organization. I have been responsible for obtaining several new members, and they are all enthusiastic members."

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A new bulletin, describing four types of level vials, is now available from W. & L. E. Gurley. This bulletin includes information on long vials, plate levels, chambered vials, and circular levels —mounted and unmounted—with tables showing sensitivity of the various vials.

For a free copy of Bulletin 7200, "Gurley Spirit Levels," write W. & L. E. Gurley, Troy, N. Y.

PLAN AHEAD

PRE-CONVENTION JOURNAL

Advertising Tie-in Opportunity

The next Annual Meeting of the American Congress on Surveying and Mapping will be held in March, 1957.

The October–December issue of the JOURNAL will tie-in with the forthcoming Convention. Prepare to advertise your exhibit and products in this important issue to stimulate the interest of those potential buyers attending this event. From an advertising standpoint, this issue will be even more valuable because of the consecutive Annual Meetings of the American Congress on Surveying and Mapping and the American Society of Photogrammetry, March 3–9, 1957.

Exclusive advertising agency for the ACSM JOURNAL:

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• *Notice*

Seventeenth Annual Meeting, March 1957

The coming 17th Annual Meeting of the American Congress on Surveying and Mapping, scheduled immediately following the 23rd Annual Meeting of the American Society of Photogrammetry, by reason of the combined influence of two great conventions closely associated in their fields of interest, offers great attendance impact and appeal to the membership. The 1957 ASP—ACSM 3–9, 1957, together with a mammoth Co-Exhibit, in the spacious convention Consecutive Meetings—both the ASP 23rd and the ACSM 17th separate annual meetings—are scheduled consecutively during the single week of March and exposition halls of the Shoreham Hotel in Washington, D. C.

Officers and committees of both societies are in full swing developing outstanding programs worthy of the individual and overlapping interests of both memberships and in keeping with the extraordinary attendance at both meetings and the three-day display of exhibits.

Particular effort is being made to plan each day's program, attuned in overlap of interest to preceding or following day, to afford every possible advantage in program continuity should it be necessary for travelers to select certain days for attendance.

A single registration is planned for the 1957 ASP–ACSM Consecutive Meetings for attendance at all or part of the ASP 23rd Annual Meeting or the ACSM 17th Annual Meeting sessions.

Entertainment and social affairs of ASP and ACSM will be enjoyed together as programed co-functions.

Exhibits will be on display from Tuesday through Thursday. The combined exhibits of leading companies from all parts of the world, and the displays by governmental mapping agencies from the United States, are features not to be missed. Convention experts by conservative estimate expect three to four thousands of people to view this exhibit. Of particular added interest to ACSM regular Annual Meeting attenders, will be the photogrammetric equipment displays and demonstrations. To those not yet having had opportunity to examine such machines and devices and to mingle with the experts in those fields, this feature itself could well be a major highlight of your attendance.

Chairman J. W. Halbrook of ASP and Chairman F. G. Williams of ACSM, with wise counsel and advice from Honorary Chairman George D. Whitmore, are working toward early issuance of program information.

Early reports from Program and Exhibits Committees indicate that no one can afford to miss the next March Annual Meetings——

the ASP sessions March 4, 5, and the morning of the 6th——

the ACSM sessions from noon on March 6th through March 7, 8, 1957.

PLAN YOUR RESERVATIONS NOW

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ACSM 17th Annual Meeting

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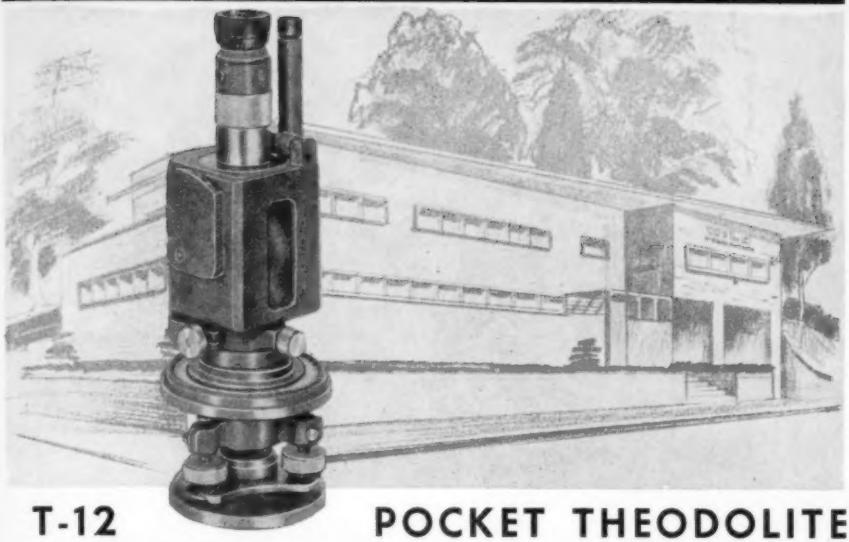

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